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WADE (B. L.), ZAUMEYER (W. J.), & HARTER (L. L.). **Variety studies in relation to Fusarium wilt of Peas.**—*Circ. U.S. Dep. Agric.* 473, 27 pp., 10 graphs, 1 map, 1938.

In a study on the varietal resistance of peas to *Fusarium orthoceras* var. *pisi* [*R.A.M.*, xvii, p. 645] 547 strains of peas of American origin and 477 from the world-wide collection of D. N. Shoemaker were grown in 1931, and some additional strains in 1932–3, on heavily infested soil near Fairfield, Washington. It was found that in the Shoemaker collection of peas resistance was about five times as common as susceptibility. A list of all varieties tested with the pe[illegible]ntages of wilt developed by their progenies is given. The samples ([illegible] in number) from Ethiopia, where peas are believed to have originated, from Denmark (4), Venezuela (2), and Peru (1), 8 out of 10 of those from Italy, and 6 out of 7 of those from Canada were immune from wilt, whereas the samples from England (137) contained fewer immune varieties (50·4 per cent.) than those of any other country; samples from the United States (64), France (65), Holland (48), and the U.S.S.R. (42) showing 65·6, 67·7, 70·8, and 76·2 per cent. immunes, respectively. The resistance to wilt was not correlated with either size or colour of seed. The results for all varieties of the three years' field tests and a supplementary greenhouse test are tabulated and notes are given on a number of the varieties and their reaction to wilt. Nearly all the important American varieties of garden and canning peas were found to be susceptible, except Green and Yellow Admiral, Canada Field peas, Green Giant, Giant Stride, Horal (which is, however, not resistant to root rots), an American strain of Phenomenon, Prince of Wales, Profusion, Senator, Wisconsin Early Sweet, and most of the marrow varieties (large white or yellow type of field pea). The resistant biotypes found in susceptible varieties and the susceptible biotypes found in resistant ones were rarely typical of the variety in which found, except in the case of Alaska and World Record. Dwarf early market-garden varieties with short internodes and zigzag stems all proved to be completely susceptible, and no resistant rogues of any horticultural value were found. Several hypotheses are offered for the origin of susceptibility to wilt in peas; England, the centre of the world's pea-breeding, is stated to be free from pea wilt, so far as is known, and it is suggested that the gene for resistance is being lost in that country, or at least that the greatest number of varieties susceptible to wilt has been produced there. Both resistant and susceptible forms

of peas are believed to have originated rather early in the history of the pea. Most of the strains representing primitive types of peas were found to be resistant to wilt. The resistance factor was completely dominant in all crosses between many different types of pea, without any indication of modifying factors or more than one gene being involved.

ANDRUS (C. F.). **Seed transmission of Macrophomina phaseoli.**—*Phytopathology*, xxviii, 9, pp. 620–634, 4 figs., 1 graph, 1938.

A tabulated account is given of experiments in 1937 conclusively demonstrating the transmissibility of *Macrophomina phaseoli* by way of the seed in the Henderson Bush variety of Lima bean [*Phaseolus lunatus*] originating in Georgia. The incidence of infection approximated to 85 and 57 per cent. in non-sterilized and surface-sterilized seed, respectively, denoting the establishment of the fungus below the seed coat in over half the material. Seed sterilization before planting (three minutes in 1 in 1,000 mercuric chloride) reduced subsequent seedling infection by some 45 per cent.

The amount of seedling injury in plants produced by infected seed was found to be negatively correlated with the germination percentage. The effect of temperature on primary infection is not altogether clear, but apparently high temperatures in the pre-emergence phase promote rapid embryo development and reduce seed decay, whereas the same factor in the post-emergence stage is liable to favour the pathogen (with an optimum at 35° C.) more than the host.

The seedling phase is a type of damping-off, typical infection occurring on the cotyledonary node, and death of the seedling resulting when the fungus invades the stem before emergence from the soil. If invasion of the stem is delayed further, only incipient lesions are formed and the stems are not infected. Protracted high humidity was necessary to induce the secondary symptoms of ashy stem blight on older plants.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, xlix, 8, pp. 423–427, 5 figs., 1938.

White rot (*Sclerotium cepivorum*) [*R.A.M.*, xiv, p. 553; xvii, p. 717] is stated to have been recorded only four times in New South Wales, once on garlic [found in 1933] and three times on onions. While it is at present of minor importance locally, it is probably more widespread than the records indicate. To prevent further spread, bulbs and seedlings of onions and related crops grown elsewhere should not be planted unless known to be healthy. If infection appears in part of a crop, the affected plants should be burnt at once and the land not planted to onions or related crops for several years.

GIBBS (J. G.). **Onion-smut, Urocystis cepulae Frost.**—*N.Z. J. Sci. Tech.*, A, xx, 2, pp. 65–68, 1 fig., 1 diag., 1938.

Onion smut (*Urocystis cepulae*) [*R.A.M.*, xvi, pp. 296, 652] was observed for the first time in New Zealand in January, 1938, infection being apparently confined to an area of some 83 acres in the Marshlands district, near Christchurch. The fungus, which is believed to have been introduced on onions imported four or five years earlier for culinary purposes, caused up to 80 per cent. loss on one of the pro-

perties inspected. Directions are given for the control of the smut by the formalin drip method as described by Anderson and Osmun in the United States [ibid., ii, p. 460; iii, p. 184].

MILBRATH (D. G.) & RYAN (H. J.). **A method of control of western Celery mosaic.**—*Bull. Dep. Agric. Calif.*, xxvii, 3, pp. 290–295, 1938.

Some figures are quoted showing the beneficial effects of the observance of celery-free periods in the Venice district of California in the control of western celery mosaic [*R.A.M.*, p. 78]. The system has been practised, at first on a voluntary basis and later under a special provision of the Agricultural Code, since 1934, when the yield of half-crates per acre sank to 311 from an area of 900 acres compared with 1,026 from 700 in 1930. By 1937 the yield had once more risen to 847 half-crates per acre over an area of 950 acres, accompanied by a corresponding improvement in the quality of the product. The celery-free period now extends from 16th September to 16th October and 11th December in the glasshouse and field, respectively.

RÖDER (K.) & SCHULTZ (H.). **Petersilie, eine neue Wirtspflanze von Erysiphe umbelliferarum De Bary.** [Parsley, a new host plant of *Erysiphe umbelliferarum* de Bary.]—*Zbl. Bakt.*, Abt. 2, xcix, 1–4, pp. 60–63, 2 figs., 1938.

The authors record the occurrence during the autumn of 1937 of a powdery mildew, morphologically identical with *Erysiphe umbelliferarum*, on two smooth-leaved varieties of parsley in the vicinity of Berlin. When naturally infected plants were transferred to the greenhouse under high moisture conditions the disease spread among healthy plants of the same varieties very rapidly and was very destructive, but curly-leaved varieties and several varieties of celery remained completely immune, even when artificially infected with spore suspensions of the fungus. This is considered to indicate a high degree of specialization of the *E. umbelliferarum* strain found on the smooth-leaved parsley varieties.

BERGER (G.). **Contribution à la connaissance de Leveillula taurica Arnaud.** [Contribution to the knowledge of *Leveillula taurica* Arnaud.]—*Ann. Épiphyt.*, N.S., iv, 1, pp. 21–25, 2 figs., 1938.

The author states that *Leveillula* [*Oidiopsis*] *taurica* [*R.A.M.*, xvii, p. 15], a long-established parasite of the globe artichoke (*Cynara scolymus*) in French Morocco, was found in the autumn of 1936 in the whole of the Chaouïa region also attacking the cardoon (*C. cardunculus*), nasturtium (*Tropaeolum majus*) [ibid., xvii, p. 461], an ornamental *Oxalis* with pink flowers, *Asclepias* sp., chillies (*Capsicum annuum*), and several varieties of tomato and eggplant [ibid., xviii, p. 11]. At the end of 1937 it was also recorded on *Ampelopsis* sp., a new host plant for the fungus. Observations indicated that tomato plants badly attacked by it bore practically no fruit, and unless controlled the disease may eventually prove as dangerous in French Morocco to its other hosts as to the globe artichoke.

HASHIOKA (Y.). **Specialization in Sphaerotheca fuliginea (Schlecht.) Poll.**—*Ann. phytopath. Soc. Japan*, viii, 2, pp. 113–123, 1 fig., 1938. [Japanese, with English summary.]

Studies on the morphological characters of the conidia of *Sphaerotheca* [*humuli* var.] *fuliginea* [*R.A.M.*, xvii, p. 579], parasitic on various plants in Formosa, and inoculation experiments with the fungus disclosed the existence of the six distinct physiologic races as indicated in the following key: A. Conidia with an average length of 29 μ; race 1 parasitic on *Impatiens balsamina*. B. Conidia with an average length of 32 μ and (*a*) with a width of 18 μ; race 2 on Cucurbitaceae and race 3 on *Lactuca indica* var. *dracoglossa* and related species; (*b*) width of 20 μ; race 4 on eggplant and 5 on *Hibiscus mutabilis*. C. Conidia with an average length of 36 μ; race 6 on *Emilia sonchifolia*.

DANA (B. F.). **Resistance and susceptibility to curly top in varieties of Squash, Cucurbita maxima.**—*Phytopathology*, xxviii, 9, pp. 649–656, 1 fig., 1938.

Two strains of squash (*Cucurbita maxima*), Umatilla Marblehead and Yakima Marblehead, have shown a general marked resistance to the beet curly top virus [*R.A.M.*, xiv, p. 339] in Oregon, where a number of other varieties, e.g., Banana, Boston Marrow, and Blue and Golden Hubbard, tested during the period from 1928 to 1937, evinced a high degree of susceptibility. The two Marbleheads are heterozygous for resistance, a few plants within each strain showing pronounced liability to curly-top injury. In the case of susceptible varieties, seedlings inoculated by viruliferous leafhoppers (*Eutettix tenellus*) immediately on emergence from the soil may die before the true leaves appear, while the new growth of older plants is definitely dwarfed, the internodes shortened, and the leaf blades develop a savoyed surface or upward marginal rolling. An upward bending of the runner tip is another marked characteristic of curly top. The blossoms on diseased shoots usually fail to set fruit. On the resistant Marbleheads a witches' broom-like habit of growth is apt to follow infection, sometimes accompanied by phyllody of the petals and pistil of pistillate flowers. The foliage is stunted and abnormally pale, while the leaf blades of the younger foliage roll upwards and are unusually rigid.

YOUNKIN (S. G.). **Pythium irregulare and damping off of Watermelons.**—*Phytopathology*, xxviii, 8, p. 596, 1938.

In the spring of 1937 in Iowa 15 isolations were made from field-grown seedlings of watermelons resistant to wilt (*Fusarium bulbigenum* var. *niveum*) [*R.A.M.*, xvii, p. 371] showing wilted cotyledons, water-soaked hypocotyls, and, occasionally, parasitized roots, and of these fungi 13 were species of *Pythium*, 11 being tentatively assigned to *P. irregulare* [ibid., xi, p. 330; xiv, p. 240]. Surface-disinfected seeds of the wilt-resistant Improved Stone Mountain No. 5 and wilt-susceptible Dixie Queen watermelon varieties were then planted in the greenhouse in soil artificially infected with *P. irregulare* and kept at about 20° C. It was found that the fungus caused seed decay, pre-emergence and post-emergence damping-off, and root necrosis in both varieties.

The average stand of the wilt-resistant and wilt-susceptible seedlings 30 days after planting was 37·3 and 40·3 per cent., respectively, as compared with 93·8 and 97·2 per cent. for the same varieties in autoclaved soil. The fungus was repeatedly isolated from infected roots, hypocotyls, and cotyledons of the plants in the infected soil, and from ungerminated seed in the same soil. *F. bulbigenum* var. *niveum* and *P. irregulare* produced similar damping-off symptoms under controlled conditions. It is believed that seedling losses under field conditions may partly be due to the latter organism.

JAGGER (I. C.), WHITAKER (T. W.), & PORTER (D. R.). **A new biologic form of powdery mildew on Muskmelons in the Imperial Valley of California.**—*Plant Dis. Reptr*, xxii, 13, pp. 275–276, 1938. [Mimeographed.]

In the middle of the season of 1938 a considerable degree of infection by powdery mildew (*Erysiphe cichoracearum*) was observed to have recently developed on the hitherto resistant No. 45 cantaloupe melon in the Imperial Valley, California [*R.A.M.*, xvii, p. 157]. Later, all the fields of this variety became affected, and several pure-line selections of No. 45 were also attacked in breeding plots.

In carefully checked parallel inoculation experiments on excised leaves, using mildew from No. 45 and from a non-resistant variety in a field where the surrounding No. 45 melons appeared to be unaffected, the mildew collected from the non-resistant variety (race No. 1) did not develop on the leaves of No. 45, though it abundantly infected the leaves of non-resistant varieties, while race No. 2, collected from No. 45 melons, developed equally abundantly on the leaves of No. 45 and those of non-resistant varieties. Similar inoculations of seedlings in flats confirmed these results.

It would appear to be certain that a new race of *E. cichoracearum* has appeared on No. 45 cantaloupe melons in the Imperial Valley. In marked contrast to the non-resistant varieties, No. 45 showed little or no defoliation or commercial loss. In the somewhat extensive cantaloupe stocks grown locally for breeding purposes a few strains appeared to be highly resistant to both races.

MARCHIONATTO (J. B.). **Researches on the Pepper diseases at Salta and Jujuy.**—*Int. Bull. Pl. Prot.*, xii, 8, pp. 169–170, 1938.

The author states that *Phytophthora capsici* [*R.A.M.*, xvi, p. 833; xvii, p. 301] was observed for the first time in the north of the Argentine in October, 1937, attacking chillies [*Capsicum annuum*] in the regions of Salta and Jujuy, since when it has been shown to be spreading over a wide area, destroying the young plants in certain localities and adult plants in others. The blight is greatly favoured by excessive moisture and is extremely virulent where peppers are cultivated after the first rains in January.

LUTHRA (J. C.), SATTAR (A.), & BEDI (K. S.). **The control of the blight disease of Gram by resistant types.**—*Curr. Sci.*, vii, 2, pp. 45–47, 1 fig., 1938.

In further work carried out in the Punjab on gram (*Cicer arietinum*)

blight (*Ascochyta rabiei*) [*R.A.M.*, xv, pp. 198, 700; xvii, p. 501] 187 types of gram obtained from America, Europe, and different parts of India were tested for resistance by spraying with an aqueous suspension of the pycnospores or spreading diseased gram debris over the plants. The only types that showed resistance were Nos. 281, 199, 4 F 32 (all very resistant), and 180 (fairly resistant), all of which originated from France but were supplied by the Bureau of Plant Industry, Washington. The type selected to replace the local seed was 4 F 32, renamed for purposes of convenience F 8. It is expected that in 1940 about 25,000 maunds of seed of this type will be available to the local growers.

IWATA (Y.). **Studies on the penetration phenomena in Pseudoperonospora cubensis Berk. et Curt.**—*Ann. phytopath. Soc. Japan*, viii, 2, pp. 124–144, 6 figs., 1938. [Japanese, with English summary.]

In studies on the mode of penetration of *Pseudoperonospora cubensis* [*R.A.M.*, xvii, p. 300] into the cucumber and other non-susceptible plants, a large number of zoospores were frequently observed to encyst on the surface of hanging drop cultures and to produce erect germ-tubes from the cyst. Zoospores in a hanging drop on the lower surface of a cucumber leaf often swim along the boundary line of the epidermal cells, frequently dashing against it, presumably in response to the diffusion of a stimulus from the epidermis. On the cucumber leaf cysts are formed on the stomata and epidermal cell boundary line, those on the former sending out a penetrating hypha into the stomatal aperture and forming a vesicle in the substomatal cavity, from which an infection hypha enters a parenchyma cell and forms a haustorium. The slender hypha extruded from a cyst on the epidermal cell boundary occasionally succeeds in penetrating a stoma. Stomatal penetration occurs on the cotyledons, but not on petioles, stems, or hypocotyls.

Inoculation experiments on 73 species of phanerogamic plants in 32 families gave positive results as regards stomatal penetration in 49 dicotyledonous plants of 22 families, including (besides a number of Cucurbitaceae) *Humulus japonicus*, buckwheat, beet (*Beta vulgaris* var. *rapacea*), *Paeonia albiflora* var. *trichocarpa*, *Brassica pekinensis*, *B. chinensis* var. *oleifera*, radish, *Phaseolus lunatus*, broad bean, *Impatiens balsamina*, *Ampelopsis* [*Vitis*] *heterophylla*, cotton, sweet potato, tomato, eggplant, *Solanum nigrum*, *Dahlia variabilis*, and *Zinnia elegans*.

On the upper surface of the epidermis stripped from the cucumber leaf, zoospore encystment and penetration are effected in the same way as on the intact leaf. On the lower surface of cucumber leaves killed by boiling water penetration occasionally takes place both through the epidermal cell boundary line and stomata, but the hyphae rapidly degenerate.

BRANAS (J.). **Chronique. Encore le court-noué.** [Current notes. Court-noué again.]—*Progr. agric. vitic.*, cx, 32, pp. 115–117, 1938.

The author states that he and his co-workers apply the term 'vine degeneration' to a series of symptoms which become progressively more serious as they appear in the forms of Reisigkrankheit, court-noué,

'anthracnose déformant', Petri's 'arriciamento' and 'roncet', as found in Sicily [*R.A.M.*, xv, p. 630; xvii, pp. 222, 793]. The degeneration disease known under these different names, and attributed to a virus, has nothing whatever in common with the bacterial disease known as the 'disease of the island of Oléron', or the bacterial diseases known as 'chabot' in Champagne, 'roncet' in Burgundy, and 'aubernage' in Yonne, or with the allegedly bacterial disease known as 'mal nero' [ibid., xvi, p. 587], while it is doubtful whether so-called bacillary gummosis [cf. ibid., xvi, p. 229] really exists at all. Low temperatures in spring may induce a non-hereditary condition the symptoms of which partly resemble those of court-noué [cf. ibid., ix, p. 578], but true court-noué is never induced by soil or climatic factors or by the plant itself: it is not a symptom of physiological weakness, although its symptoms are aggravated by such weakness.

VOBORIL (F.). **Zum starken Auftreten von Chlorose in den Weinbaugebieten des Gaues Niederdonau.** [On the prevalence of chlorosis in the viticultural districts of the Lower Danube province.]—Reprinted from *Weinland, 1938*, 8/2, 1 p., 1938.

Two types of chlorosis, one lime-induced and the other (and more serious) due to unknown pathogenic agents, are stated to have assumed exceptionally virulent forms, mostly on Riparia stocks, in the vineyards of the Lower Danube valley, Austria, during the last eight years. The parasitic form of the disturbance should properly be termed 'bleaching', the lower leaves being of a dull, leaden appearance, the shoots of unequal length with a profusion of suckers, the internodes irregularly shortened towards the branch tips, and the upper leaves becoming progressively smaller and shrivelling. In the second year from the inception of the disease the affected vines die off.

OSTERWALDER (A.). **Prüfung einiger Peronospora-Bekämpfungsmittel.** [Testing of some preparations for *Peronospora* control.]—*Schweiz. Z. Obst- u. Weinb.*, xlvii, 10, pp. 192–194, 1938.

Good control of *Peronospora* [*Plasmopara viticola*] on 170 Räuschling vines was obtained in trials at the Wädenswil (Switzerland) Experiment Station in 1937 by six applications (31st May, 12th and 22nd June, 5th and 19th July, and 2nd August) of Bordo-Xex [*R.A.M.*, xv, p. 588] (1·5 per cent. for the early treatments, 2 per cent. later), 2 per cent. virikupfer [viricuivre: ibid., xvi, p. 152; xvii, p. 375] (16 per cent. copper), and cupromaag (0·5, later 1 per cent.), all from Chem. Fabrik Dr. Maag, Dielsdorf. Cupryl and Kupferstaub Schering were less satisfactory, and, indeed, none of the preparations tested proved quite as effective as the standard 1·5 to 2 per cent. Bordeaux mixture.

Plantesygdomme i Danmark 1937. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1937. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, xliii, 2, pp. 222–278, 2 figs., 2 graphs, 1938 [English summary.]

This report, prepared on the usual lines [cf. *R.A.M.*, xvii, p. 13], contains the following among other items of interest. Reclamation

disease of wheat [ibid., xvii, p. 508], associated with copper deficiency, developed over an area in which the acid subsoil had been ploughed up to counteract manganese deficiency (grey speck) [ibid., xvii, p. 586], the latter being very prevalent in winter wheat, and still more so in rye. *Puccinia graminis*, of rare occurrence in Denmark during the last 20 years, was widespread on wheat, oats, and barley, causing losses of up to 500 kg. per hect. in the first-named crop. A number of barberries were detected and eradicated in connexion with this exceptional outbreak [ibid., ix, p. 98].

Wart disease (*Synchytrium endobioticum*) was reported from six new administrative areas [ibid., xvii, p. 13]. *Rhizoctonia* [*Corticium*] *solani* was more virulent than at any time during the past four or five years, destroying entire plots of potatoes. Infection of potatoes by *Colletotrichum atramentarium* [ibid., xvii, p. 60], new to the country, was apparently promoted by potassium deficiency. *Monilia* [*Oospora*] *fimicola*, a source of heavy losses in mushroom [*Psalliota* spp.] beds in 1936 [ibid., xvii, pp. 13, 792], was successfully combated in 1937 by appropriate cultural methods, including early transference of the compost to the houses, allowing it to warm up gradually, and burning sulphur at the maximum temperature of 55° C.

Many plum and myrobalan [*Prunus divaricata*] trees were killed by *Pseudomonas mors-prunorum* [ibid., xvii, p. 13 and below, p. 122], which also attacked sweet cherries in some localities. *Plasmopara viticola*, ordinarily a rarity in Denmark, was reported from several places.

A wilt of five- to six-year-old elms in a large cemetery near Copenhagen, first observed in 1935–6, was shown by isolation tests to be due to *Verticillium albo-atrum* [ibid., xvi, p. 353], from which, however, the trees were already recovering in 1937.

Slight damage to flax was caused by *Polyspora lini* [ibid., xv, p. 652; xvii, p. 396], a new record for Denmark.

THOMAS (K. M.). **Detailed administration Report of the Government Mycologist, Madras, for the year 1937–38.**—21 pp., 2 graphs, 1938.

In pot tests the application of ammonium sulphate and sodium nitrate at rates equivalent to 40, 80, 160, and 240 lb. of nitrogen per acre increased infection by *Piricularia oryzae* [*R.A.M.*, xvii, pp. 14, 836] in susceptible varieties of rice. For equal amounts of nitrogen, sodium nitrate induced greater susceptibility than ammonium sulphate. The most resistant variety tested, Co. 4, remained unaffected by heavy doses of nitrogen. When 20 rice varieties were sown at monthly intervals from August to December, the highest infection occurred in the August sowings, but even in these the varieties 10,998, Co. 11, Adt 6, and Co. 4 remained completely resistant. In any one variety, the late sown suffered less than the early sown crops, the difference being attributed to more frequent rain, more numerous cloudy days, and increased relative humidity during the early period.

The use of ceresan as a seed treatment against rice foot rot (*Fusarium moniliforme* var. *majus*) [*Gibberella fujikuroi*: ibid., xvii, p. 14] is gaining ground in Coimbatore.

Nigrospora oryzae was found on several occasions on rice [ibid., xvi,

p. 490], but repeated inoculations with pure cultures of the fungus were negative.

The incidence of red gram [*Vigna unguiculata*] wilt (*Fusarium vasinfectum*) steadily increased from the fifth week after emergence, reached a peak between the thirteenth and fifteenth weeks, this period coinciding with flowering and pod formation, and then declined. The fungus spreads about two-thirds of the distance up the stem, but does not affect the pods. Infected soil invariably gave rise to infection, whereas sterilized soil did not. A comparative study of the cotton and red gram wilt organisms showed them to be morphologically and physiologically different strains of *F. vasinfectum*. The cotton strain did not infect red gram, and vice versa. A third strain of *F. vasinfectum* was found on chilli pepper [*Capsicum annuum*], the crop being considerably damaged after flowering.

Analysis of the data obtained in extensive field experiments on the control of koleroga disease (*Phytophthora arecae*) [ibid., xvii, pp. 14, 295, 625] of areca palm showed that Bordeaux mixture 1 and 2 per cent. gave, respectively, 13 and 5·1 per cent. infection, one and two applications of Bordeaux mixture gave 14·9 and 4·3 per cent. infection, respectively, while the addition of vegetable oils and casein as spreaders to the Bordeaux mixture was more effective than resin.

The *Gloeosporium* disease of areca inflorescences and nuts in South Kanara [ibid., xvii, p. 14] was also found in parts of the Coimbatore district. The symptoms consist in spotting of the leaves, leaf sheaths, peduncles, and pedicels, shedding of the flowers and tender nuts, and partial withering of the branches. Acervuli develop profusely on the surface of tender nuts and stalks. Two gardens showed, respectively, 42 and 59 per cent. infection of the bunches. Inoculation tests demonstrated that the fungus was parasitic on tender areca and coco-nut inflorescences.

Laboratory studies with the horse gram [*Dolichos biflorus*] wilt organism (*Macrophomina phaseoli*) [loc. cit.] showed that it grew at P_H 3·04 to 7·97, the optimum value being P_H 5·17 to 8·04. The P_H value in the nutrient media shifted from acid to alkaline and vice versa to a point near P_H 7. The thermal death point was between 55° and 56° C. at 10 minutes' exposure. Pycnidia of *M. phaseoli* developed in cultures on several solid media and Leonian's pycnidial medium. *Trichoderma lignorum* inhibited the growth of the fungus.

Cardamom (*Amomum subulatum*) was affected by a mosaic mottling of the leaves and tender shoots, apparently due to a virus. The disease is spread by planting infected rhizomes, but it is not seed-borne. A species of *Cephalosporium* was isolated from rhizomes showing the rot disease, and was shown by inoculation tests to cause a soft rot of tender rhizomes.

Ginger soft rot (*Pythium butleri*) [cf. ibid., xvii, p. 294], for which no reliable control measures are at present known, is a menace to the industry on the west coast, where about 18,000 acres are planted to ginger. The oospores of the fungus were found on the scales of preserved seed rhizomes, which, under certain circumstances, became attacked during storage.

In varietal resistance trials the sugar-cane varieties Co. 205 and Co.

335 showed no mosaic from 1933 to 1938, inclusive, while Co. 355 and P.O.J. 2878 showed none during the four seasons when they were tested.

A new disease of brinjal [eggplant] was characterized by a reduction in leaf size, alteration in leaf shape and texture, shortening of the nodes, the absence of flowers, and sterility. No causal organism was found, and the condition may be due to a virus. The disease was not sap-transmissible, but was transferred by grafting to eggplant and *Datura fastuosa*, the first symptoms appearing 21 days after grafting. The older leaves of the grafted plant remained normal, while the new growths became characteristically affected.

Tobacco in the Coimbatore and Salem districts was affected by mosaic, ring spot, and leaf curl. Transmission experiments indicated that a number of strains of mosaic may be present locally. The leaf curl resembles kroepoek [ibid., xvii, p. 75] and was transmissible by grafting.

Surveys showed that black, brown, and yellow rusts of wheat [*Puccinia graminis*, *P. triticina*, and *P. glumarum*, respectively] and barley dwarf rust [*P. anomala*] are present in the Nilgiri hills throughout the year, but only wheat brown rust in the Palni hills.

A disease of clove trees, characterized by splitting and flaking of the bark, was associated with a species of *Ganoderma*, the fructifications of which appeared on the dead wood and branches.

NATTRASS (R. M.). **Annual report of the Plant Pathologist for the year 1937.**—*Rep. Dir. Agric. Cyprus, 1937*, pp. 48–50, 1938.

The following are among the items of interest in this report [cf. *R.A.M.*, xvii, p. 15] in addition to those already recorded from other sources. Batches of *Triticum durum* seed from Syria, with spontaneous heavy contamination by *Tilletia caries*, were treated with copper carbonate and a proprietary mercurial dust, which reduced the incidence of infection from 23·7 to 6·9 and 6·8 per cent., respectively. In continued trials of imported wheats for rust reaction, Pusa and Geeraling remained entirely free from *Puccinia graminis*, while Ford, Dundee, and Nabawa were only mildly attacked, the two last-named, however, being highly susceptible to *P. glumarum*: all varieties were slightly infected by *P. triticina*.

A number of young and mature apple trees on poorly drained sites in the Peradpedhi district were killed by *Rosellinia necatrix* [ibid., xvi, p. 688]. Black spot [scab] (*Fusicladium dendriticum*) [*Venturia inaequalis*], previously of little importance in Cyprus, severely attacked the fruit in the same region. Heavy infection of peaches by powdery mildew (*Sphaerotheca pannosa*) [ibid., xvii, p. 693] resulted in distortion of the ripe fruit.

In a seed potato disinfection experiment, conducted in co-operation with A. E. Muskett and W. J. Megaw, the test material consisted of three lots, (A) and (B) severely infected by powdery and common scab [*Spongospora subterranea* and *Actinomyces scabies*], respectively, and (C) commercially clean tubers, practically free from both diseases. Of each lot, one-third was treated in Northern Ireland before shipment, one-third disinfected on arrival in Cyprus with 0·5 per cent. aretan [ibid., xvii, p. 835], and one-third planted without treatment. Little

or no wastage developed in any of the lots during the period of transit from 5th December, 1936, to 4th January, 1937. The following results were obtained. No powdery scab appeared on any tubers from the resulting crop. Disinfection in Northern Ireland and in Cyprus reduced the incidence of common scab in lot A from 1·72 to 0·23 and 0·08 per cent., respectively; in lot B from 10·72 to 0·32 and 0·30, respectively; in lot C from 9·88 to 0·084 and 0·068 per cent., respectively. It is apparent from these figures that the extent of common scab infection on the seed does not appreciably influence the future course of the disease on non-infested soil, and also that the efficacy of the home and Cyprus treatments did not materially differ.

Vines in most districts and at all altitudes were attacked by *Cercospora roesleri* [ibid., xvi, p. 493].

Phomopsis [*Diaporthe*] *citri* and *Phytophthora citrophthora* were responsible, respectively, for lemon and orange rots. Exanthema of lemon and orange twigs [ibid., xvii, pp. 16, 656] and endoxerosis [internal decline] of the fruits [ibid., xvi, p. 313] were observed at Famagusta, while mottle leaf [see below, p. 103] was present in the same district and Morphou.

Local cowpea varieties suffered from rust (*Uromyces vignae*), which did not, however, attack the resistant [American] Iron and Brabham [ibid., xiv, p. 742].

The following new records were made during 1937: *Stagonospora iridis* on *Iris florentina* and *Cercospora rosae* on rose [ibid., xvii, pp. 506, 753].

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, xlix, 9, pp. 487–490, 4 figs., 1938.

The following items may be noticed in this series of notes. Bacterial blight (*Bacterium juglandis*) is stated to be a major disease of walnuts [*R.A.M.*, xvii, p. 420] in New South Wales. It is carried over through the winter chiefly in diseased buds, and is spread mainly by rain splashes. In grafted stock the spray applications may be given to all trees at one operation, but seedling trees must be 'spot'-sprayed as they reach the appropriate stage of blossom development in order to secure protection and to avoid the pollination difficulties that occur if the trees are sprayed at incorrect blossom stages. The first spray application is made in the spring when the buds are expanding, young leaves are forming, and the catkins are almost fully expanded, but before most of the pistillate flowers have come into full bloom. The second application is made immediately after most of the nut-bearing flowers have been pollinated.

For some years the Biological Branch has used small cereal grain as a basis for the culture of mushroom spawn and while it has proved very satisfactory in many respects, uniformly good results are more likely to be secured from compost spawn, since certain types of fungal contamination are more difficult to detect in grain spawn than in compost spawn, and furthermore grain spawn is very attractive to mice.

Parham (B. E. V.). **Central Agricultural Division. Annual report for 1937.**—*Annu. Bull. Dep. Agric. Fiji*, pp. 37–49, 1938.

During 1937, shirlan AG gave very satisfactory control of the banana

leaf-spotting organisms *Cercospora musae*, *Uromyces musae*, and *Cordana* [*Scolecotrichum*] *musae* in Fiji [*R.A.M.*, xvii, pp. 331, 760], particularly in one plot of Gros Michel. Very promising results were also given in a plot of Veimama bananas by spraying with Bordeaux mixture (4–5–40).

The imported banana varieties I.C. 2. and Lacatan showed severe infection by bunchy top [loc. cit.] in the field, while many Gros Michel plants were also affected in Koro Island and Tailevu Province. Although the Veimama variety is apparently tolerant to bunchy top, it showed 5 to 30 per cent. infection in the field.

Immature bunches of Blue Java bananas were completely destroyed as a result of early infection by *Gloeosporium musarum* [ibid., xviii, p. 41], the fruits shrivelling up and becoming mummified.

A bacterial infection, probably *Bacterium maculicola*, caused loss of maturing cauliflower [ibid., xv, p. 696] heads and leaves in a dry locality. A condition resembling 'whiptail' [ibid., xiii, p. 344], in which no heads were formed, was common in cauliflower plots.

LARTER (L. N. H.). **Plant pathology.**—*Rep. Dep. Sci. & Agric. Jamaica, 1937*, pp. 77–78, 1938.

During the early part of 1937 (the driest period of the year), banana leaf spot (*Cercospora musae*) [*R.A.M.*, xvii, p. 375 and preceding abstract] became less severe in Jamaica, at least in its more serious form, but by the beginning of August, while only a few areas of intense infection were noticeable, marked spread had occurred of the mild form round the severely affected areas, especially in fields of young plants. By the middle of October, after a period of rains, infection had become widespread, though confined to areas where outbreaks had occurred in 1936. In irrigated areas in the south, where planters were endeavouring to spray regularly, infection became worse owing to interruption of the spraying schedule by rain. In localities where water was available and topography permitted, spraying with Bordeaux mixture was advised, but on hillsides where marketable fruit was being grown, growers were recommended to use copper sulphate-lime dust. On exposed denuded ridges where infection was severe, and where under normal conditions the fruit produced was poor, growers were advised to destroy the affected plants.

Among various other diseases observed during the year were storage rot of potatoes (*Fusarium oxysporum*) and *Helminthosporium sacchari* [ibid., xvi, p. 206] on sugar-cane.

ROMBOUTS (J. E.). **Moléstias criptogamicas do Cacauiero : resumo da literatura mundial e observações na zona cacauiera da Baía.** [Cryptogamic diseases of Cacao: a summary of the world literature and observations in the Cacao-producing region of Bahia.]—*Bol. Minist. Agric., Rio de J.*, xxvi, 10–12, pp. 33–57, 1937. [Received August, 1938.]

An annotated list, supplemented by a three-page bibliography, is given of the diseases affecting the cacao crop in all the countries where it is grown, the following having been observed in Bahia, Brazil: *Phytophthora palmivora*, '*Calonectria bahiensis* Hempel' (*Bol. Agric.*,

S. Paulo, 1904), *Corticium* (?) *lilaco-fuscum*, *C. salmonicolor*, *C. stevensii* [*R.A.M.*, xiv, p. 795], (?) *Armillaria mellea*, and *Botryodiplodia theobromae*.

PORTER (R. H.), HENDERSHOTT (W. E.), & DAVIS (G. N.). **Indexing farmers' seed lots for seed-borne organisms and response to seed disinfectants.**—*Res. Bull. Ia agric. Exp. Sta.* 238, pp. 243–272, 1938.

The [tabulated] results obtained from laboratory and field germination tests carried out in Iowa from 1932 to 1936, inclusive, demonstrated that detection of *Gibberella saubinetii* and related species of *Fusarium*, and of *Helminthosporium sativum* and other species of this genus on seed samples of barley, oats, and wheat, mostly received from farmers, was possible in the laboratory when the seedlings were germinated on moist blotters at 20° C. [cf. *R.A.M.*, xvi, p. 444]. The development of blight on seedlings grown in a mixture of autoclaved soil and sand demonstrated the presence in the seed of *G. saubinetii* and *F.* spp. The organisms causing dry rot of maize, chiefly *Diplodia zeae*, *G. saubinetii*, and *F.* spp. were found on seedlings grown on moist blotters at 24° to 27°. *Basisporium gallarum* [*Nigrospora* sp.] was more readily detected by examination of ungerminated, heavily diseased seed. The presence of the various seed-borne organisms on the seeds of barley, maize, oats, and wheat generally resulted in blighted seedlings and reduced germination.

Treatment of infected seed of barley, maize, oats, and wheat with organic mercury compounds gave almost complete control of seedling blights in the laboratory and, in nearly all cases, gave significant increases in germination both in the laboratory and the field. Samples that benefited most in the laboratory, benefited most in the field also. The effect of seed treatment on flax seed germination was similar to that on small grains in so far as the number of normal seedlings was concerned.

A satisfactory dust for laboratory purposes was obtained by diluting 5 per cent. ethyl mercury phosphate to a 1 per cent. content by the addition of French talc, button dust, or gypsum, the effect of the diluted dusts being similar both in laboratory and field tests. Used alone, the fillers increased the germination and yield of barley, but less than when combined with the mercury compound. Ethyl mercury phosphate and ethyl mercury chloride controlled the development of species of *Aspergillus*, *Macrosporium*, *Mucor*, *Penicillium*, and *Rhizopus* on seeds tested on blotters.

On the whole, the difference in yield from treated and untreated barley, maize, and oats seed was significantly in favour of the treated seed, the greater increases occurring in lots infected with seed-borne fungi. Germination of barley, maize, flax, oats, and wheat seed was generally lower in the field than in the laboratory, but the relative position of a sample in the laboratory was generally maintained in the field. In seasons of insufficient rain, field germination does not provide an adequate indication of seed viability, seed laboratory tests being more reliable for this purpose.

Blair (I. D.). **Seed-disinfection trials with cereals.**—*N.Z. J. Sci. Tech.*, A, xx, 2, pp. 128–132, 1938.

A tabulated account is given of recent experiments at the Canterbury Agricultural College, New Zealand, in cereal seed-grain disinfection with agrosan G (agrosan, 1936 type), ceresan U.T. 1875, and two experimental grades of dust containing a higher percentage of mercury. In ordinary field soil the preparations exerted no significant effect on the germination and yield of Garton and Algerian oats and Tuscan wheat, though there was a general tendency towards an increase in both in the treated seed. Where the dusted wheat was sown in soil heavily inoculated with *Fusarium culmorum*, all the treatments significantly increased the amount of field germination, the largest increase of 12·4 per cent. over the control being given by one of the experimental mercury dusts at the rate of ¼ oz. per bush. Correspondingly substantial increases of yield were obtained in most of the treated plots, the maximum of 30·2 per cent. being given by the ceresan. Although wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] may be well under control in New Zealand as a result of seed-grain disinfection [*R.A.M.*, xvii, pp. 20, 517], the advisability of continuing the practice is convincingly demonstrated by the results of the tests herein reported.

Johnston (C. O.), Melchers (L. E.), & Miller (J. O.). **The Wheat stem rust epidemic of 1937 in Kansas.**—*Plant Dis. Reptr, Suppl.* 107, pp. 83–94, 2 graphs, 3 maps, 1938. [Mimeographed.]

In this account of the wheat stem [black] rust (*Puccinia graminis tritici*) epidemic in Kansas in 1937 [cf. *R.A.M.*, xvi, p. 25] the authors state that very heavy losses resulted in the eastern half of the State, and in some localities even greater damage was sustained than during the severe epidemic of 1935. Rainfall was below normal throughout May and June, except for a very slight excess in the central part of the State in May. In the development of wheat black rust epidemics minimum temperatures appear to be more important than mean and maximum temperatures, since heavy infections have not been noted locally until the minimum temperatures become high enough to favour abundant uredospore germination. The occurrence of some form of free moisture in the presence of relatively high minimum temperatures would be highly favourable to infection. In parts of Kansas, rank growth, due to light, frequent rains in May and June, conduced to heavy infection. There was no evidence that the rust overwintered in the uredo stage in any appreciable quantity. Preliminary data indicated that physiologic races 11 and 56 [ibid., xiv, p. 618; xvii, p. 381] were two of the most important present. The average loss caused by the disease throughout Kansas was 6·6 per cent., the total loss being estimated at 11,000,000 bush., rather more than $10,000,000 in value.

The soft red winter varieties, such as Fulcaster, Clarkan, Harvest Queen, and Michigan Wonder were heavily rusted in all sections of the State. In the north-east, Early Blackhull had the lowest percentage infection (though this variety appeared in only one test), and was followed, in order, by Kanred, Blackhull, Kawvale, and Iobred, the two last-named giving good yields.

Phipps (I. F.). **The effect of leaf-rust on yield and baking quality of Wheat.**—*J. Aust. Inst. agric. Sci.*, iv, 3, pp. 148–151, 1 fig., 1938.

In a study on leaf rust of wheat (*Puccinia triticina*), in which the disease was controlled by spraying with colloidal sulphur (1 in 500) plus agral spreader, applied at a rate of ½ gal. per plot of 64 sq. links, sprayed and unsprayed plots of the susceptible variety Ranee showed 10 and 85 per cent. infection, respectively, and the yield of the unsprayed plots was lower by 14·5 per cent. Infection reduced the nitrogen content of the grain of Ranee wheat from an average of 2·869 to 2·673 per cent., and experimental loaves baked from samples of this wheat showed an average reduction in loaf volume from 578 to 510 c.c. for the standard bake, and from 708 to 640 c.c. when nymalt improver was added. Spraying with colloidal sulphur exerted no effect on the yield of a resistant hybrid (Gluyas×Hope). *P. graminis*, the other rust affecting wheat in Australia, was virtually absent from the experimental plots.

Castellani (E.). **Osservazioni preliminari sulle ruggini del Grano nell' altopiano etiopico.** [Preliminary observations on Wheat rusts in the Ethiopian plateau.]—Reprinted from *Agricoltura colon.*, xxxii, 9, 10 pp., 2 graphs, 1 map, 1938.

Wheat is grown in Italian East Africa between latitudes 16° 30′ and 4° 30′ N. at altitudes from 1,700 to 3,200 m. above sea-level, and under widely different climatic and ecological conditions. Isolated heavy showers (separated by long intervals of drought) which may fall after the rainy season, together with high temperatures, very strongly favour the development and spread of rusts (*Puccinia graminis* [*R.A.M.*, xvii, p. 732], *P. glumarum*, and *P. triticina*). The first-named is the most serious disease of wheat in the colony, and causes enormous losses, while *P. triticina* does not appear to be responsible for much damage, though present in every wheat-growing area. *P. glumarum* occurs chiefly at very high altitudes. Drought subsequently aggravates the effects of rust infection.

Among the local wheats grown in Eritrea the most susceptible to the rusts is Amaharai, while Felasit shows slight resistance. In the vicinity of Lake Ascianghi some local black-eared wheats, apparently of good quality, were observed to show resistance. Among Italian wheats tested locally, Riale, Quaderna, and Edda were conspicuously resistant in two years' tests, and Mentana was most resistant of all, giving excellent yields even in a year when infection was exceptionally severe.

In the vicinity of Oletta (Central Abyssinia) a recently introduced wheat, Dicoftù, or European Sinde, referable to *Triticum polonicum*, showed much more resistance to *P. graminis* than the local wheat. In the experimental field at Olettà, among 15 Italian wheat varieties under test the most resistant to the three rusts were Messicano and families Nos. 20, 516, 517, and 43 of the same selection; Capinera and Azizia 302 were very resistant, and Rossia 33 and Duro Conti 45 somewhat less so.

The only species of barberry reported from Abyssinia are *Berberis petitiana* (= *B. aristata*) and *B. arguta*, the former being probably very

rare, as it was not found by the author, and the latter is known only from one locality; it is not known whether the aecidial stage of *P. graminis* occurs on these barberries.

Skvortzoff (S. S.). К физиологии гриба **Ustilago tritici (Pers.) Jens.** [On the physiology of the fungus *Ustilago tritici* (Pers.) Jens.]—*Pl. Prot., Leningr., 1938*, 16, pp. 65–78, 10 figs., 1938. [English summary.]

The author transferred monospore cultures of *Ustilago tritici* [*R.A.M.*, xvii, p. 434] on beer wort to various culture media and found that generally the fungus grew best on sterilized slices of potato or carrot, or on potato and carrot agar plus 3 per cent. glucose, the liquid media, with the exception of beer wort (7 per cent. sugar), and the synthetic being less favourable for its development. On solid media the mycelium grew in small, round lumps, which rose above the surface and eventually formed colonies with a granular wrinkled surface, while in liquid media the small lumps remained submerged. The rate of growth was slow, only 0·0049 gm. dry matter being formed after 60 days at 24° C. on Herzberg's liquid and 0·0060 gm. after 45 days on a solid medium. The minimum, optimum, and maximum temperatures for growth were found to be 7° to 9°, 22° to 24°, and 30° to 32°, respectively. The fungus withstood a temperature of 45° for 10 minutes, but was killed by exposure to the same temperature for 20 to 40 minutes, or to 55° for 1 to 5 minutes. It failed to grow on any medium under anaerobic conditions.

Vladimirskaya (Mme M. E.). Указания к расчету начальной температуры воды при термическом обеззараживании зерна против пыльной головни. [Calculation of the initial temperature of water for thermal disinfection of seed-grain against loose smut.]—*Pl. Prot., Leningr., 1938*, 16, pp. 118–122, 1938.

The author points out that in the usual wet treatment against loose smut of wheat [*Ustilago tritici*: see preceding abstract], in which the grain is pre-soaked in water at 28° to 32° C. for 4 hours and then immersed in water at 52° for 8 minutes, the temperature of the water is lowered when the grain, which is colder than the water, is added. The standard recommendation of making the initial temperature of the water 2° to 3° hotter is not considered satisfactory, as the final temperature of the water depends upon the following varying factors: amount of water, amount of grain, its temperature, its moisture content, and its specific heat. The correct initial temperature of the water (T_2°) can be calculated from two formulae, the first being $w = [(1-x_0)\ 0{\cdot}37+x_0]\ (T_1^\circ - T_0^\circ)n$, and the second $T_2^\circ = \frac{w}{m} + T_1^\circ$, in which w is the number of calories needed to heat n kg. of grain from their original temperature T_0° to T_1°, the temperature required for the treatment, x_0 is the water content of the grain, 0·37 is the specific heat of starch (assuming that grain is entirely composed of starch), and m = litres of water used for treatment. A table of initial temperatures based on these equations is given for both the pre-soaking and steeping treatments for varying quantities of water and grain of different temperatures and water contents.

Pervukhina (Mme N. V.). К физиологии некоторых видов рода **Fusarium** на Пшенице. [Concerning the physiology of some species of *Fusarium* on Wheat.]—*Pl. Prot., Leningr., 1938*, 16, pp. 59–64, 1938. [English summary.]

In this study, conducted on similar lines to that of Mme Fedotova [*R.A.M.*, xv, p. 456] and using the same cultural medium, the pathogenicity of several species of *Fusarium* (of different geographical origin), as established by inoculation experiments by Tupenevitch, was found to be correlated with the amount of amine nitrogen accumulated by them per gm. of dry matter. The isolates 384 (actively parasitic), 885 and 93 (both parasitic) of *F. avenaceum* were found to accumulate 0·3556, 4·7413, and 4·9150 mg. of amine nitrogen, respectively; the isolates 1026 (parasitic) and 1020 (semi-parasitic) of *F. graminearum* [*Gibberella saubinetii*] accumulated 4·4487 and 8·4406 mg., respectively; and the isolates 821 of *F. sporotrichioides* and 316 of *F. scirpi* (both semi-parasitic) accumulated 7·0552 and 13·1647 mg., respectively. It appears from these results that the amounts of amine nitrogen formed by the various species do afford an indication of their pathogenicity. Data on three isolates of *F. avenaceum* and two of *G. saubinetii* showed, with one exception, that a direct correlation exists between the amount of amine nitrogen accumulated and the weight of mycelium produced.

Millikan (C. R.). **A preliminary note on the relation of zinc to disease in cereals.**—*J. Dep. Agric. Vict.*, xxxvi, 8, pp. 409–416, 7 figs., 1938.

The results of experiments, commenced in 1936 on several farms in the Wimmera district of Victoria, showed that Free Gallipoli wheat treated with zinc sulphate at rates of 15 and 30 lb. per acre, in conjunction with superphosphate, exhibited a superior growth, earlier maturity, and an increased yield as compared with plants receiving superphosphate only [cf. *R.A.M.*, xvi, p. 754]. Observations indicated that the plants treated with zinc produced a more vigorous root system and suffered less injury from eelworm (*Heterodera schachtii*) and the root-rot fungi (*Rhizoctonia* [*Corticium*] *solani*, *Helminthosporium sativum*, *H.* sp., *Fusarium* sp., *F. culmorum*, *Curvularia ramosa*, and *C.* sp.) than those treated only with superphosphate. A similar response in Mulga oats was observed in experiments made during 1937. In preliminary experiments with sand cultures, however, the addition of zinc to the nutrient solution did not produce an increased growth of the wheat plants comparable with that seen in the field. The addition of small quantities of zinc sulphate to the culture medium (glucose agar+ 0·1, 0·25, or 0·5 per cent. zinc sulphate) caused a marked retardation in growth and reduction of sporulation in *C. ramosa* and *H. sativum* as well as inducing variation in these species. Chemical analyses and extensive milling and baking tests showed that the zinc treatment had no significant influence on the milling and baking qualities of wheat.

Gaul (F.). **Beobachtungen über Getreide-Fusskrankheiten, insbesondere Halmbruchkrankheit.** [Observations on cereal foot rots, especially the straw-breaking disease.]—*Dtsch. landw. Pr.*, lxv, 36, pp. 461–462, 3 figs., 1938.

In the lime and red marl soils of the Hildburghausen (Franconia)

district of Germany, *Ophiobolus graminis* does not ordinarily cause appreciable damage except in wheat stands following barley, whereas for the last five years lodging of wheat due to *Cercosporella herpotrichoides* [*R.A.M.*, xviii, p. 15] has been prevalent. Observations in early July on the effects of a varying rotational sequence on the incidence of straw-breaking in a wheat crop revealed a complete absence of the disease in the plots following several years of sainfoin [*Onobrychis sativa*], black medick [*Medicago lupulina*] left standing for seed until the end of September, and late-harvested potatoes, while lodging occurred in the portion of the stand following potatoes lifted early. Besides a judicious scheme of crop rotation, other remedial measures include late sowing, methods of tillage calculated to bring the soil into the requisite state of tilth, and a well-balanced system of fertilizing.

Ikata (S.) & Kawai (I.). **Some experiments concerning the development of yellow mosaic disease (white streak) of Wheat. Relation between the development of yellow mosaic disease of Wheat and soil temperature.**—*J. Pl. Prot.*, xxiv, pp. 491–501, 847–854, 1937. [Japanese. Abs. in *Jap. J. Bot.*, ix, 3, pp. (109)–(110), 1938.]

The virus of yellow mosaic (white streak) of wheat [*R.A.M.*, xvi, p. 665] was experimentally shown to enter its host exclusively through the roots and root-crowns, mostly at a soil-depth of about 3 cm. and never below 15 cm. The disease was not induced by a filtrate from infected soil. The optimum soil temperature for the development of yellow mosaic was found to be about 15° C., fairly severe effects being also observed at 10°, while at 20° the symptoms were inconspicuous, and at 25° imperceptible. The results of frame and field experiments confirmed the foregoing data.

Weck (R.). **Flugbrandbekämpfung bei Wintergerste in Eckendorf.** [Control of loose smut of Winter Barley at Eckendorf.]—*Nachr. SchädlBekämpf., Leverkusen*, xiii, 3, pp. 93–102, 1 fig., 1938.

This paper has already been noticed from another source [*R.A.M.*, xvii, p. 594].

Straib (W.). **Über eine nichtparasitäre Blattkrankheit an Keimpflanzen von Gerste.** [On a non-parasitic leaf disease of Barley seedlings.]—*Phytopath. Z.*, xi, 3, pp. 319–329, 4 figs., 1938.

Particulars are given of a disturbance, presumably metabolic in origin, occurring during the winter months on greenhouse barley seedlings at the Gliesmarode (Brunswick) branch of the Biological Institute, and characterized by the development on the leaf blades of greasy spots, rapidly giving place to a glassy necrotic condition of the tissues [cf. *R.A.M.*, xv, p. 352]. After the first leaf has reached maturity it seldom becomes affected, even under favourable environmental conditions (especially temperatures above 15° C. and abundance of light), though the new foliage may contract the typical grease-spot symptoms. In a test to determine the influence of different soil types on the incidence of the disease, Bavaria seedlings were most severely injured on heavy clay, grassland soil with a high proportion of humus, and light loam, whereas the trouble was practically absent on building and

quartz sands and completely so on compost, though in a further test the alkalization of the last-named with sodium carbonate (up to 32 c.c. per pot of 190 gm. soil) induced the glazed appearance. Soil reaction, therefore, plays an important part in the etiology of the barley spot under observation. Both ammonium sulphate and ammonium nitrate (5 c.c. of a 1·5 per cent. solution per pot) prevented the occurrence of necroses on Bavaria plants in clay, loam, loamy sand, sand, and grassland soils, but other nutrient salts exerted no conclusive action on the course of the disease, which is considered to be distinct from a somewhat similar condition described by Christensen from the United States [ibid., xiii, p. 761]. Over 500 barley varieties and a few of oats have been observed to suffer from the trouble in question, which may cause very considerable inconvenience in greenhouse inoculation experiments with parasitic fungi.

Coffman (F. A.), Murphy (H. C.), Stanton (T. R.), Burnett (L. C.), & Humphrey (H. B.). **New smut and rust resistant Oats from Markton crosses.**—*J. Amer. Soc. Agron.*, xxx, 10, pp. 797–815, 1938.

A definite programme was initiated in 1927 for the breeding of varieties of oats suitable for north-central United States conditions with combined resistance to stem [black] rust (*Puccinia graminis avenae*) and smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]) [*R.A.M.*, xvii, pp. 308, 451, 658, 738]. The smut-resistant variety Markton was crossed with the rust-resistant Richland, Iogold, Edkin, Iowa 444, and Rainbow. Some 5,000 selections and re-selections have been repeatedly subjected to inoculation with spores of the above-mentioned organisms and crown rust (*P. coronata avenae*) [*P. lolii*] in the greenhouse and field, and a number have been advanced to yield tests in plots.

Many of the selections have shown resistance to black rust and the two smuts through several seasons, while some Markton × Rainbow hybrids were also resistant to certain races of crown rust. The most promising selections were derived from crosses between Markton × Rainbow and Markton × Iogold, some of which offer exceptional agricultural possibilities in respect of bushel weight, stiffness of straw, and capacity to withstand drought.

Swanson (A. F.). **'Weak neck' in Sorghum.**—*J. Amer. Soc. Agron.*, xxx, 9, pp. 720–724, 1 fig., 1938.

Dwarf varieties of sorghum at Hays, Kansas, were extensively affected in 1937 by a disorder termed 'weak neck', which agrees in part with the description given by L. H. Pammel and collaborators of a *Fusarium* disease of the crop observed in Iowa (*Ia agric. Exp. Sta. Res. Bull.* 33, 1916). Symptoms of the trouble include disintegration of the peduncle tissues associated with a black or grey discoloration, extensive breaking-over of the heads at the juncture between the peduncle and upper node of the stalk, and poorly developed heads containing light-weight, lustreless seed. Aphids are commonly present on the diseased plants, but whether or not they act as vectors of bacterial or fungal infection remains to be determined.

All true sorgos appear to be highly resistant to 'weak neck', which

further causes little damage in strains of Blackhull Kafir and a new variety called Club. Milo and hybrids between it and Kafir are very susceptible. Observations on hundreds of hybrids of Club × Day and Wheatland Back-cross × Club, Day, and Colby milo, all originally derived from crosses with Dwarf yellow milo as one of the parents, showed that many were diseased. In the Club × Day progenies the yellow-seeded segregates generally showed a much higher degree of susceptibility than those with white seeds (resembling the Club parent). Semi-complete resistance to 'weak neck' was observed in the F_3 progenies of the cross Leoti Red sorgo × Club, while Wheatland was also fairly promising in this respect. No correlation was detected between *Pythium* root rot [*P. arrhenomanes*: *R.A.M.*, xvi, p. 741; xvii, p. 735] and 'weak neck' of sorghum.

Fawcett (H. S.). **Transmission of psorosis of Citrus.**—Abs. in *Phytopathology*, xxviii, 9, p. 669, 1938.

Of the various methods of transmission tried in experiments on citrus psorosis [*R.A.M.*, xvii, pp. 313, 442, 595 and next abstract] in California, only the fusion of live cells of the diseased buds, bark, or root grafts with those of healthy plants yielded successful results. The recognition in 1933 of symptoms of the disease on the foliage provided a means of identifying certain species of citrus with apparently sound bark as carriers of the virus. Many such carriers are considerably more tolerant of the presence of the infective principle than those showing bark symptoms, such as sweet orange, grapefruit, and tangerine. The transmission of psorosis by budding to various species, varieties, and hybrids of citrus has been accomplished in numerous tests. The knowledge of foliar, as well as of bark, symptoms finds a useful practical application in the selection of virus-free sources for propagating bud wood in order to avoid the transmission of psorosis by this means.

Fawcett (H. S.) & Klotz (L. J.). **Types and symptoms of psorosis and psorosis-like diseases of Citrus.**—Abs. in *Phytopathology*, xxviii, 9, p. 670, 1938.

Two types of citrus psorosis [see preceding abstract], A and B, induce similar bark symptoms in California, but the latter spreads more rapidly and results in gum formation, frequently well ahead of the cortical eruptions. Foliar symptoms consisting of small, pale areas, 1 to 3 mm. in diameter, on young, rapidly growing leaves are also similar in both types, but in older leaves the B form of the disease may cause the development of large, chlorotic ring spots resembling those of zonate chlorosis in Brazil [*R.A.M.*, xvii, p. 595], while A produces only occasional small, circular or semi-circular annular lesions. The fruit is seldom affected by A, whereas B gives rise to large, discoloured, circular to semicircular rings or grooves, the sunken tissue ranging from pale yellow to brown, with occasional necrotic breakdown; in the case of grapefruit, a bumpy, mis-shapen aspect may develop. In concave gum disease there are hollows in the bark, with gum-infiltrated layers in the wood and flecking of the young foliage similar to that typical of psorosis A and B. Possibly the latter are merely variants of a single virus closely related to concave gum disease. Leprosis [see

next abstract] in Florida is characterized by cortical symptoms on the older twigs somewhat resembling those of psorosis, but the rapidly growing foliage exhibits no particularly distinctive features and the circular lesions on mature leaves and on the fruit are entirely different. The leaf- and fruit-spotting associated with concentric ring spot in South Africa [ibid., xiv, p. 679] also has points in common with leprosis, and it is suspected that several disorders of the foregoing types are due to the same or nearly allied viruses.

BITANCOURT (A. A.). **Seira a Laranjeira Sabará resistente ou imune a leprose?** [Will the Sabará Orange be resistant to, or immune from, leprosis?]—*Biologico*, iv, 9, p. 300, 1938.

Attention is drawn to the high degree of resistance to leprosis [*R.A.M.*, xv, p. 291; xvii, p. 595], virtually amounting to immunity, shown in recent preliminary experiments in São Paulo, Brazil, by the Sabará sweet orange, a hybrid between the common sweet orange (*Citrus sinensis*) and the tangerine (*C. nobilis deliciosa*), the latter being as resistant as its offspring to the disorder under investigation. Local growers are urged to make further observations on the reaction of the Sabará variety to leprosis in proximity to infected trees.

MOREIRA (S.). **Xyloporosis.**—*Hadar*, xi, 8, pp. 234–237, 9 figs., 1938.

After briefly reviewing the work of Reichert and Perlberger and others on xyloporosis of citrus in Palestine [*R.A.M.*, xv, p. 647], the writer describes the occurrence of an apparently identical condition in Barão sweet oranges grafted on the Lima da Pérsia sour variety at the Limeira Citrus Station, São Paulo, Brazil, where his conclusions were verified by H. S. Fawcett and the cause of the disorder attributed to a specific disharmony between the stock and scion. Control may be effected by inarching with sour orange stock or top-working with Pêra orange or Persian lime. Several other instances of incompatible unions observed at the same Station are described, some of which, e.g., Gallego, Rio Claro, and Chrystal lemons grafted on sour orange, show typical symptoms of xyloporosis, while others are free from them. In Palestine the condition is probably attributable to a lack of harmony between the sweet lime stock and the Shamuti orange scion.

In a rejoinder I. Reichert and J. Perlberger state that xyloporosis cannot be explained solely on the basis of uncongeniality between graft partners, since a union between Shamuti orange and sweet lemon, for instance, has yielded copious crops for the last 50 years, though this is one of the factors under consideration with respect to the etiology of the disease.

[An expanded account of these studies in Portuguese, with an English summary, appears in *J. Agron., S. Paulo*, i, 3, pp. 217–226, 10 figs., 1938.]

FARKAS (A.). **The practical application of impregnated wrappers against fungal decay of Citrus fruit.**—*Hadar*, xi, 9, pp. 261–267, 1 graph, 1938.

A fully tabulated account is given of storage and shipping experiments carried out in 1937–8 to determine the value of diphenyl-impregnated wrappers in the control of fungal decay of oranges [chiefly

Penicillium digitatum, *P. italicum*, and *Diplodia natalensis*: *R.A.M.*, xiv, pp. 30, 506], the former at Rehoboth, Palestine, and the latter in collaboration with the Pardess Co-operative Society, which arranged for the transport of the fruit to England and its inspection on arrival.

With regard to the storage tests, the use of impregnated wrappers enabled the duration of the keeping period to be safely extended to one month under adverse conditions (ripe fruit, summer months) without recourse either to refrigeration or special ventilation; the amount of wastage did not exceed 2 per cent. in such consignments. In more favourable circumstances the treated fruit can be stored for two months, or early pickings even longer. When decay ultimately sets in, the fruit remains dry and does not contaminate the adjacent sound oranges. In shipped fruit the wastage in diphenyl-treated fruit was well below 5 per cent. under normal conditions and did not reach 7 even under the most unfavourable.

In the course of a discussion on the commercial applicability of the treatment, which incidentally controlled 'nooksan' [ibid., xvii, p. 595], it is mentioned that the slight but characteristic odour of diphenyl could no longer be detected on the fruit after two to three weeks' storage, and further that recent chemical analyses by a London official revealed absolutely no trace of the substance in the wrapped orange itself and only 0·1 mg. in the peel. It is calculated, on a conservative basis, that an annual saving of £100,000 on the Jewish crop of 7,000,000 boxes could be effected by the systematic use of diphenyl-treated wrappers, a considerably more economic method of treatment than the provision of refrigerated vessels.

Trout (S. A.), Tindale (G. B.), & Huelin (F. E.). **The storage of Oranges with special reference to locality, maturity, respiration, and chemical composition.**—*Pamphl. Coun. sci. industr. Res. Aust.* 80, 59 pp., 14 graphs, 1938.

In experiments with Washington Navel oranges exposed in a sweating chamber to temperatures of 78° to 90° F. and a humidity of either 50 or 85 per cent. saturation for three to five days prior to storage (at 40°), none of these treatments was effective in combating mould (*Penicillium digitatum*) [*R.A.M.*, xvii, pp. 26, 741] when the fruits were wounded and inoculated before sweating, whereas when the fruits were sweated first the mould was largely controlled, 70 per cent. wastage developing after four weeks under the former conditions and only 2 per cent. under the latter.

Fruit with shallow wounds and unwounded fruit, picked on 8th July, developed 25 and 10 per cent. mould, respectively, after ten weeks in storage at 40°, whereas fruit picked on later dates developed mould more rapidly, wounded and unwounded fruit picked on 2nd September showing 25 and 10 per cent. mould, respectively, after only five weeks. In another experiment fruit picked on 8th July became unpalatable after ten weeks and developed 10 per cent. mould after twelve, while the fruit picked on 2nd September became unpalatable after three weeks and developed 10 per cent. mould after five. In further experiments with fruit picked at different dates and stored at 40° it was found that the period between the time of picking and the loss of

palatability and subsequent development of mould, in short, the storage life of the fruit, is longer at an early date of picking than at any later one, by approximately the same period as that between the two picking dates. In fruit from Merbein settlement 10 per cent. mould wastage developed about six weeks after the loss of palatability, while in fruit from Lockington moulding occurred at the same time as the loss of palatability. In experiments with fruit from five separate districts picked at different dates it was found that the storage life of the fruit was terminated by loss of palatability in all cases except two, when it was ended by the occurrence of storage spot, the mould development occurring either simultaneously or two to three weeks later.

STREETS (R. B.). **A nursery blight of Citrus caused by Phytophthora citrophthora.**—Abs. in *Phytopathology*, xxviii, 9, p. 673, 1938.

An unusual disease of nursery citrus trees involving sudden wilting and death of the leaves and stem-blackening within a zone 6 to 12 in. long, just above the bud union, is reported [? from Arizona]. The wood of the sweet seedling orange scion was definitely discoloured, and a white, cottony fungal growth developed on agar cultures of the wood and inner bark. The sour orange rootstock was unaffected. The fungus proved to be indistinguishable in cultural characters and pathogenicity from *Phytophthora citrophthora*, so that the trouble under observation is evidently a hitherto undescribed form of brown rot gummosis [*R.A.M.*, xvii, p. 313]. Favourable conditions for infection were induced by the heavy, wet soil and close covering of the 'lath house' in which the trees were growing. Several hundred trees were rendered worthless by the disease, but the uninfected ones were saved by the prompt application of Bordeaux mixture.

DOIDGE (E[THEL] M.). **The successful eradication of Citrus canker in South Africa.**—*Fmg S. Afr.*, xiii, 151, p. 400, 1938.

The history of the eradication of citrus canker (*Bacterium* [*Pseudomonas*] *citri*) from South Africa [*R.A.M.*, xv, p. 425] is briefly outlined. The campaign strenuously waged against the disease since its detection in 1917 culminated in 1938 in the abolition of all planting restrictions.

LEACH (R.). **Report of the Plant Pathologist, Mlanje Experiment Station.**—*Rep. Dep. Agric. Nyasald, 1937*, pp. 27–30, 1938.

During the period under review, citrus trees in Nyasaland badly affected with mottle leaf [*R.A.M.*, xvii, pp. 16, 743] regained a healthy colour after spraying with zinc sulphate-lime (10–5–100). No sticker or spreader was used. Other mycological work was much restricted.

TAYLOR (G. G.) & BURNS (M. M.). **'Mottle-leaf' of Citrus in New Zealand.**—*N.Z. J. Sci. Tech.*, A, xx, 2, pp. 115–119, 4 figs., 1938.

Mottle leaf of citrus, which is stated to be assuming increasing importance in the Auckland, Bay of Plenty, and Hawke's Bay districts of New Zealand, affecting Eureka and Lisbon lemons, Poorman orange (or New Zealand grapefruit), and all sweet orange varieties, has so far (fifteen months after treatment) failed to respond by any improvement to zinc sulphate sprays [see preceding abstract], but very promising

results have been given in preliminary tests in the Auckland area by applications of manganese sulphate plus hydrated lime at a strength of 5–2½–100.

DUTHIE (D. W.). **Coconut wilt in Essequibo and Pomeroon districts.**—*Agric. J. Brit. Guiana*, ix, 3, pp. 147–152, 1938.

Field observations on the Essequibo coast showed that coco-nut trees 15 to 25 years old, growing both on clay and sand, were affected by wilt, the symptoms of which were almost identical with those observed in Trinidad [*R.A.M.*, xvii, p. 390]. The disease is believed to be caused by planting coco-nuts after sugar-cane, a shallow-rooted crop, in abandoned sugar-cane estates, where the subsoil is too compact and saline to allow easy root penetration. The well-drained, highly organic top soil favours the rapid growth of young coco-nuts and the development of roots near the surface, with the result that the trees live on the verge of drought. The safest method of preventing the occurrence of the disease would be to leave the land in bush for a few years before replanting.

Coco-nuts growing on the banks of the Pomeroon River on soils varying from deep pegasse to pegasse clay, were found to grow particularly well at first but to wilt after about 10 years, whereas trees growing on the dams may live for 20 to 30 years. The disease under these conditions is attributed, in agreement with Bain's explanation [loc. cit.], to the high water-table (in wet seasons 18 to 24 inches below the surface at high tide), which limits the root growth and thus makes the trees unable to withstand dry seasons and the strain of bearing. Coco-nuts should, therefore, be planted only on land which is at least 6 ft. above the water-level of the river at high tide.

BLISS (D. E.). **Spoilage of Dates as related to management of the fruit bunch.**—*Rep. Date Grs' Inst., 1938*, pp. 7–12, 6 figs., 1938.

In field experiments carried out in California from 1935 to 1937, inclusive, to ascertain the effect on spoilage of Deglet Noor date fruits (including disease and injuries) of aeration and thinning of the fruit bunch, aeration was effected by (1) separation of the fruit strands by the insertion of wire rings, (2) protecting the bunches with an aerated type of paper bag allowing increased ventilation, and (3) removal of the fruit strands from the centre of the bunch. The results obtained [which are tabulated] showed that in 1935 checking (development of small, transverse ruptures in the epidermis) was considerably reduced by aeration, and fungal rots [unspecified] even further diminished. In 1936 checking and black nose [*R.A.M.*, x, p. 657] were severe on all the experimental lots, while rotting was about twice as great in the lightly thinned as in the heavily thinned bunches. In 1937, when no rain fell during ripening, losses were very small, and the different treatments did not have marked effects.

It is concluded that the removal of 50 to 60 per cent. of the fruits per bunch is desirable. The use of wire rings is advised during the critical time of ripening, but if no rain falls and the aeration is excessive, the rings should be removed. Bags permitting free circulation of the air are recommended.

VENKATARAYAN (S. V.). **Coffee black bean.**—*Curr. Sci.*, vii, 3, pp. 113–114, 1 fig., 1938.

Observations in Mysore showed that coffee black bean [*R.A.M.*, xvii, p. 813] is associated with absence of the embryo. Black bean fruits develop on the plant just as the others do, and may sometimes be detected by the sense of touch, as owing to reduced turgidity they feel wilted to the fingers. The affected fruits remain attached to the plant until the other fruits mature. It is suggested that the condition may possibly result from a failure of pollination or fertilization. Sterility has been known in coffee, and the fruit may develop parthenogenetically, if there is absence or incompatibility of pollen. It is possible that many coffee plants which are natural hybrids develop some of their fruits parthenogenetically. Feng found that the seeds of Asiatic-American cotton hybrids contained either a very small embryo or none at all, even though possessing well-developed seed coats, and stated (*Bot. Gaz.*, xcvi, pp. 485–504, 1935) that 'the ovules of the sterile F_1 hybrids were shrunken, dry, and black; no fibres developed on the seed coats. The ovules apparently do not develop at all'. This is somewhat similar to what happens in the case of coffee black bean.

CHESTER (K. S.). **Gravity grading, a method for reducing seed-borne disease in Cotton.**—*Phytopathology*, xxviii, 10, pp. 745–749, 1938.

Laboratory, greenhouse, and field experiments on cotton seed germination and emergence indicate that nearly all weak and diseased material (internally infected, e.g., by *Glomerella gossypii*, *Bacterium malvacearum*, and *Fusarium moniliforme* [*Gibberella fujikuroi*]) may be eliminated by delinting the seed with concentrated sulphuric acid, followed by suspension in water and separation of the sinking from the floating fractions, the former being used for planting and the latter (ordinarily constituting about 40 per cent. of the whole by weight) sold for processing. Healthy germination and emergence of the heavy seed were over twice and 1½ times as great, respectively, as in the light and ungraded delinted seed batches.

NETTLES (W. C.). **Cottonseed treatment gives larger yield.**—Abs. in *Phytopathology*, xxviii, 9, p. 665, 1938.

A substantial reduction in the incidence of sore shin of cotton [*Corticium solani*] is stated to have been effected in South Carolina in 1937 by seed treatment with ceresan [*R.A.M.*, xvi, p. 315], which reduced the incidence of infection over an area of 250,000 acres from 60 to 16 per cent. On 115 farms situated in various parts of the State, the treated seed yielded 16·7 per cent. more bolls than the untreated, equivalent to an extra 205 lb. seed cotton per acre. These figures are based on partial returns only, and it is estimated that the total value of the increase over the area under observation for 1937 will amount to $1,537,500.

DICK (J. B.) & TISDALE (H. B.). **Fertilizers in relation to incidence of wilt as affecting a resistant and a susceptible variety.**—Abs. in *Phytopathology*, xxviii, 9, pp. 666–667, 1938.

Experiments at the Alabama Experiment Station in 1937 to

determine the effect of 27 different combinations of nitrogen, phosphate, and potash on the incidence of cotton wilt [*Fusarium vasinfectum*: *R.A.M.*, xviii, p. 24 and next abstracts], in a resistant (Cook 307) and susceptible (Half and Half) variety, showed that joint applications of nitrogen and potash effectively reduce wilt and increase yields, whereas the inclusion of phosphate in the treatment materially increases the amount of infection, the normally beneficial action of the last-named element on productivity being thus largely counteracted.

Tisdale (H. B.) & Dick (J. B.). **Cotton varieties in relation to Cotton wilt.**—Abs. in *Phytopathology*, xxviii, 9, p. 667, 1938.

No evidence was obtained in the course of studies in Alabama during 1936–7 for the existence of physiologic races of the cotton wilt organism [*Fusarium vasinfectum*: see preceding and next abstracts], notwithstanding marked differences in virulence according to situation and local environmental conditions. Resistant varieties benefit more than susceptible ones from moderate applications of potash, an excess of which, in fact, is liable to damage the former while not adversely affecting the latter. These observations are considered to point to a relationship between wilt resistance and capacity for potash utilization.

Cralley (E. M.) & Tharp (W. H.). **Field studies on Fusarium wilt of Cotton in Arkansas. The relation of 'wilt' and 'total infection' as influenced by potash fertilization.**—Abs. in *Phytopathology*, xxviii, 9, p. 667, 1938.

In potash fertilization experiments on three cotton varieties—resistant, tolerant, and susceptible—in two localities of Arkansas in 1936 and 1937, infection by the wilt fungus [*Fusarium vasinfectum*: see preceding abstracts] was found to develop progressively with advance in season in the three types in the order named. Significant differences in relative disease severity between potash-fertilized and untreated plants did not become conspicuously apparent until late in the growing season. Applications of potash after planting decreased in efficacy concurrently with the lapse of time between planting and treatment.

Ezekiel (W. N.). **Cotton root rot in Texas in 1937, and conditions affecting its local prevalence.**—*Plant Dis. Reptr*, xxii, 15, pp. 315–324, 6 graphs, 1 map, 1938. [Mimeographed.]

A survey of 770 cotton fields in 22 counties of Texas, made in 1937, showed that root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xvii, p. 590] was less abundant than usual, presumably on account of general low precipitation during the growing season. The losses for the whole State for 1937 are estimated to amount to about 300,000 bales of cotton, or 5·9 per cent. of a normal yield. Multiple correlation analysis of losses in ten selected counties showed that under equally favourable soil conditions an increase of 4 in. of rainfall in April, May, June, and July could be correlated with about 15, 15, 20, and 30 per cent. increases in root rot, respectively, while additional rainfall in August had no effect on the percentage of infection. The disease was not prevalent in areas with a mean annual air temperature of 60° F. or below, being more abundant at higher temperatures. The presence or absence of

root rot in the different sections of Texas appears to be determined largely by the relative prevalence of the favourable neutral to slightly alkaline soils and high mean temperatures, its destructiveness in any year being dependent chiefly on rainfall.

Boczkowska (Mme M.). **Próby zwalczania płaszczyńca Burakowego Piesma quadrata Fieb. grzybem owadożernym.** [Attempts to control the Beet leaf bug *Piesma quadrata* Fieb. by means of an entomogenous fungus.]—Reprinted from *Roczn. Ochr. Rośl.*, v, 5, 23 pp., 5 figs., 1938. [French summary.]

In laboratory experiments on the biological control of the beet leaf bug *Piesma quadratum*, the vector of beet crinkle [*R.A.M.*, xvii, p. 642], conducted during the years 1935 to 1937 in Poland, the larvae and imagines of this insect were artificially inoculated with an unspecified species of *Beauveria* either by means of pure cultures or of direct transfers from dead insects, and placed on leaves of living plants, which were then enclosed in bags. Signs of disease appeared three days after inoculation, dead insects were found two days later, and most were killed within a week, larvae and imagines being equally susceptible. The fungus was able to infect the insects at an air humidity varying from 56 to 100 per cent. saturation (the temperature being about 18° C.), but to fructify only at 100 per cent.

The results obtained in the laboratory were confirmed by field trials, in which from 55 to 86 per cent. of the inoculated insects enclosed in bags or flasks were killed in 13 days. The fungus suffers, however, from the disadvantage of needing a long incubation period, thus allowing the appearance of a second generation of the insect, and of failing to fructify in case of drought. Attempts to infect the beet bug in the field without using any kind of enclosure reduced the number of imagines in the spring but was without effect on the second generation.

Blunck (H.). **Feinde und Krankheiten der Maikäfer.** [Enemies and diseases of the Cockchafer.]—*Z. PflKrankh.*, xlviii, 9–11, pp. 488–507, 9 figs., 1938.

Among the natural enemies of the cockchafer (*Melolontha melolontha*) discussed in this survey of the subject are *Beauveria densa* [*R.A.M.*, xvii, p. 816] and *Cordyceps militaris* [ibid., xvi, p. 532], as well as bacteria (*Bacillus melolonthae* and a *Coccobacillus*).

Karling (J. S.). **Harposporium anguillulae.**—*Mycologia*, xxx, 5, pp. 512–519, 18 figs., 1938.

As a result of an intensive study of the Hyphomycete *Harposporium anguillulae*, found on nematodes, the author concludes that *Polyrhina multiformis* is a synonym of this species. The conidiophore arises as a papillate bud from a branch of the internal mycelium, which may be enlarged to a bulbous structure. The bud pierces the host wall, elongates, and becomes delimited by a basal wall. Further growth takes place and transverse walls are usually formed dividing the conidiophore into four linear segments. Globular cells are produced on these segments and develop elongated, curved, cylindrical apical beaks, which are abstricted as conidia, only one conidium being formed from a globular

cell. The conidiophores vary considerably in structure and range from 6 to 60 μ in length and 2·5 to 4 μ in breadth, and the number of linear segments varies from 0 to 5. They may bear secondary, tertiary, or even quaternary globular cells. The conidia measure 5 to 14 by 1·5 to 2·5 μ. Thick-walled, intramatrical, hyaline resting cells, which the author regards as chlamydospores, occurred singly or in chain-like groups, were usually rectangular, slightly swollen, somewhat oval and barrel-shaped, measured from 3·5 to 7 μ in length by 4 to 6·6 μ in diameter, and were sometimes almost isodiametric. Numerous germinating chlamydospores were observed.

CASTELLANI (A.). **Smooth and rough forms of Monilia tropicalis Cast. in the sputum of the same patient.**—*J. trop. Med.* (*Hyg.*), xli, 17, pp. 277–279, 6 figs., 1938.

Particulars are given of two cases of bronchomoniliasis caused by *Monilia* [*Candida*] *tropicalis* [*R.A.M.*, xvi, p. 484] in which the patients' sputum contained both smooth and rough forms of the fungus [cf. ibid., xvii, p. 677]. In one case (a 60-year-old woman, details of whose condition were presented in *J. trop. Med.* (*Hyg.*), 1st October, 1935, by the author and T. Standring) the smooth and rough strains remained true in subcultures for a period of about eight months, at the end of which the rough one gradually reverted to the smooth state and has since remained smooth. In the case at present under observation (a 41-year-old man) the smooth and rough strains had maintained their individual characters for two months at the time of writing.

AMBROSIONI (P.). **Contributo allo studio delle onicomicosi da blastosporee.** [A contribution to the study of onychomycoses due to Blastosporeae]—*G. ital. Derm. Sif.*, lxxix, 3, pp. 671–676, 1 pl., 1938.

From the middle digit of the left hand of a 60-year-old woman suffering from an intractable onychomycosis the writer isolated in pure culture on Sabouraud's and other standard media at the Microbiological Institute, Rome, a fungus corresponding in morphological, cultural, biochemical, and biological characters with Castellani's *Monilia krusoides* (*J. trop. Med.* (*Hyg.*), xl, p. 304, 1937), which the writer, however, prefers to designate *Mycotorula krusoides* (Cast.). Positive results were obtained in intravenal inoculation experiments on rabbits.

DURHAM (O. C.). **An unusual shower of fungus spores.**—*J. Amer. med. Ass.*, cxi, 1, pp. 24–25, 1 map, 1938.

Attention is drawn to a remarkable instance of the atmospheric transport of mould allergens in the form of *Alternaria* and *Hormodendrum* spores on 6th and 7th October, [1937], throughout the eastern part of the United States [*R.A.M.*, xvii, p. 599]. During this period thousands of tons of mould spores were transported for an average distance of several hundred miles. At 17 stations on and east of the Mississippi, where records were taken, the average increase in the *Alternaria* spores during the storm was 100 times that of the mean daily count for the month. At no time in the course of the writer's ten-year study on atmospheric pollen in relation to hay-fever has the

transfer of allergenic particles been observed in such large amounts or over so widespread an area.

FRAENKEL (E. M.). **Moulds and asthma.**—*Brit. med. J., 1938*, 4044, pp. 68–69, 1938.

After briefly reviewing previous work on the relationship between moulds and certain respiratory diseases [*R.A.M.*, xvii, p. 821, and preceding abstract], the writer reports the results of the examination of 185 allergic patients in England, of whom 148 (92 males and 56 females) suffered from asthma and 21 from hay-fever and rhinitis. Of the 80 males tested for skin reactions with moulds, 41 (51 per cent.) gave positive results, the corresponding figure for the 51 females being 28 (55 per cent.). Of 290 male patients similarly tested by the writer in Germany only 43 (15 per cent.) reacted positively to moulds, the comparable figures for 232 females being 41 (18 per cent.). Roughly speaking, the English figures agree with those reported by Schonwald from Seattle [Washington: ibid., xvii, p. 395], the prevalence in both cases being probably associated with the damp climate, while those from Germany approximate more closely to records from the interior of the United States.

HENRICI (A. T.). **An endotoxin from Aspergillus fumigatus.**—Abs. in *J. Bact.*, xxxvi, 3, p. 278, 1938.

Cell sap from a pathogenic strain of *Aspergillus fumigatus* was found to be toxic to rabbits, guinea-pigs, mice, and chickens [*R.A.M.*, xiii, p. 510; xv, p. 804], while the broth filtrate is innocuous. A less degree of toxicity is shown by the cell sap of pathogenic strains of *A. flavus* and *A. oryzae*. The cell sap is haemolytic *in vitro*. In the symptoms induced in experimental animals by injections the toxin closely resembles that of *Amanita phalloides*, from which it differs, however, in being thermolabile and non-toxic by oral administration. The *Aspergillus* toxin withstands 45 minutes' exposure to a temperature of 55° C., but it is inactivated by 15 minutes at 62°. Rabbits and guinea-pigs may be gradually immunized to tolerate ten or more lethal doses; the serum of actively immunized rabbits affords protection to guinea-pigs, and neutralizes the haemolytic action of the toxin *in vitro*.

PROKOPTCHOUK (A.). **Klinische und experimentelle Angaben über Chromomycosis.** [Clinical and experimental data on chromomycosis.]—*Vyestn. Venerol. Derm., 1938*, 3, pp. 21–27, 1938. [Russian. Abs. in *Zbl. Haut- u. GeschlKr.*, lx, 12–13, p. 628, 1938.]

Fourteen cases of verrucose, tuberous, nodular, and overlapping types of chromoblastomycosis, the first-named attributed by Jaczewski to *Hormodendrum rossicum* [*R.A.M.*, xvii, p. 529], are stated to have been observed in the U.S.S.R. Inoculations with fungal material from diseased tissues on rabbits, guinea-pigs, and rats, resulted in pustules, which gave rise in pure culture to the typical dark green, velvety colonies of *Hormodendrum*.

MABALAY (E. B.). **Studies on the cultivation of Pityrosporon of Malassez.**—*Mon. Bull. Philipp. Hlth Serv.*, xviii, pp. 15–19, 1938. [Abs. in *Zbl. ges. Hyg.*, xliii, 1, pp. 72–73, 1938.]

From skin scrapings in a case of achromia symmetrica (plantilla)

tr ted at the Cebu (Philippines) Skin Dispensary the writer isolated on Sabouraud's dextrose agar, with the addition of 3 to 5 drops of sterile coco-nut oil per 100 c.c., ampulliform structures of the *Pityrosporum* of Malassez [*P. malassezi*: *R.A.M.*, xvi, p. 609], which formed moist, white, later darkening colonies. Gelatine was not liquefied, and neither acid nor gas was produced from dextrose, lactose, or other sugars. Hyphae were not formed. Olive, cottonseed, and castor oils and lard also stimulated the development of the fungus, which responded less favourably to beeswax or vaseline and failed to grow in the presence of paraffin, cedar, or *Wightia* oil. Mild inflammatory disturbances were induced in guinea-pigs by inoculation on shaved areas of the skin.

Zenin (A. S.). **Zur Ätiologie und Epidemiologie der Dermatomykosen im Kuibyschewgebiet.** [On the etiology and epidermiology of the dermatomycoses in the Kuibyscheff district.]—*Vyestn. Venerol. Derm., 1938*, 2, pp. 5–9, 1938. [Russian. Abs. in *Zbl. Haut- u. GeschlKr.*, lx, 10–11, p. 513, 1938.]

Trichophyton violaceum [*R.A.M.*, xviii, p. 27] was found to be responsible for a very high proportion (93·8 per cent.) of the 1,666 cases of dermatomycosis handled during a period of four years in the Kuibyscheff district of the U.S.S.R. [ibid., xvii, p. 245]. By means of intensive propaganda a substantial reduction in the incidence of infection was achieved (from 1,266 cases of trichophytosis in 1933 to 451 in 1936). Favus was diagnosed in 3·75 and 12·2 per cent. of the urban and rural cases, respectively, while microsporosis occurred only four times.

Ch'in (T. L.). **Potassium tellurite and copper sulphate in Sabouraud's medium for isolation of pathogenic fungi.**—*Proc. Soc. exp. Biol., N.Y.*, xxxviii, 5, pp. 700–702, 1938.

In isolating on Sabouraud's glucose agar *Trichophyton violaceum*, *Microsporon ferrugineum* [*R.A.M.*, xv, p. 580], *Achorion schoenleini*, *Epidermophyton* [*Trichophyton*] *rubrum*, and *E. inguinale* [*E. floccosum*] from infected human hair and skin at the Peiping [Peking] Union Medical College, bacterial contamination was effectively prevented by the addition to the medium of 0·015 per cent. potassium tellurite or 0·05 per cent. copper sulphate. *A. schoenleini* was more resistant to these chemicals than the other fungi tested, growing well at a concentration of 0·02 per cent. potassium tellurite or 0·06 per cent. copper sulphate.

De Verebély (T.). **Morphologie de l'hyphomycosis pedis.** [The morphology of 'hyphomycosis pedis'.]—*Pr. méd., 1938* (I), 51, pp. 989–992, 7 figs., 1938.

The writer fully describes and discusses two cases of the so-called 'Madura foot' [*R.A.M.*, xvii, p. 747] (for which the designation 'hyphomycosis pedis' is preferred as more explanatory and correct) studied in Hungary 30 years ago, but previously reported in Hungarian only and therefore omitted from current bibliographical surveys of the relevant literature. Both patients were young men, one a weaver and the other a farmer, who contracted the disease as a sequel to injuries

to the foot. Material from the infected tissues gave rise in pure culture to white granules in one instance and to black ones in the other; the morphological characters of the fungus in both cases agreed with those of *Indiella mansoni* [cf. ibid., vi, p. 612 *et passim*].

MAYERHOFER (E.) & DRAGIŠIĆ (B.). **Weiterer Bericht über kindliche Maisbrandvergiftungen (Ustilaginismus).** [A further report on juvenile cases of Maize smut poisoning (ustilaginism).]—*Z. Kinderheilk.*, lix, 5, pp. 543–552, 4 figs., 1938.

Further investigations at the Zagreb (Yugoslavia) University Children's Hospital on maize smut poisoning (ustilaginism) are described in connexion with 15 fresh cases, and comparative details given of the spontaneous symptoms of the disease in a child and those artificially induced in mice by inoculation with the principal agent, *Ustilago maidis* [*U. zeae*: *R.A.M.*, xvii, p. 526; xviii, p. 18], agreement being observed in eight symptom groups. Ustilaginism is stated to be closely allied to true infantile acrodynia, from which it differs mainly in its etiology. In addition to *U. zeae*, *U. reiliana* [*Sorosporium reilianum*] may be implicated to some extent in the causation of ustilaginism, whereas *U. fischeri* is of negligible importance in this respect.

HENRY (A. W.) & CAMPBELL (J. A.). **Inactivation of seed-borne plant pathogens in the soil.**—*Canad. J. Res.*, Sect. C., xvi, 9, pp. 331–338, 1938.

In a study on the antibiotic action of soil micro-organisms, flax seeds naturally and artificially infected with *Polyspora lini* [see above, p. 88] and artificially inoculated with *Colletotrichum lini* [*R.A.M.*, xvi, p. 676] was used in several series of pot experiments. In five experiments with *P. lini* and the susceptible Bison flax the percentages of diseased seedlings in sterilized and unsterilized soil were 12 and 2·1, 17·9 and 5·4, 29·1 and 4·2, 18·8 and 1·9, and 14·3 and 1, respectively, showing in each case a reduction of infection in natural soil, ascribed to the activity of soil micro-organisms. When flax seed naturally infected with *P. lini* was treated with 95 per cent. alcohol (by dipping and flaming), leytosan P (methyl mercury phosphate) [ibid., xvii, p. 605], or formalin (1 in 320) prior to sowing, the same reduction in infection was observed on natural soil, indicating that the micro-organisms were capable of inactivating the internally borne inoculum, which was not affected by the fungicides. In three experiments with *C. lini* the percentage of diseased seedlings on sterilized and unsterilized soil at soil temperatures of 12°, 17°, and 24° C. was 53 and 14, 71 and 18, and 75 and 19, respectively. A bacterium [unspecified] was found causing rapid disintegration of the conidia of *C. lini* in the soil. Analogous experiments with the wheat bunt fungi [*Tilletia caries* and *T. foetens*] did not yield consistent results and are being continued.

WOLLENWEBER (H. W.). **'Sphaerella linicola' n. sp. die Ursache der Amerikanischen Leinpest (Pasmo- oder 'Septoria'-Krankheit).** [*Sphaerella linicola* n. sp., the agent of the American Flax epidemic ('spasm' or *Septoria* disease).]—*Rev. Bot. Inst. 'Miguel Lillo'*, ii, 2a, pp. 483–494, 1 pl., 1938. [Spanish summary.]

One of a number of specimens of flax straw from the Argentine

procured for purposes of comparison with American and European material, all affected by the 'spasm' disease hitherto attributed to *Septoria linicola* (syn. *Phlyctaena* (?) *linicola*, *Septogloeum linicola* [*R.A.M.*, xvii, p. 458]), bore black perithecia on the stunted, dark brown, necrotic main axis. Ascospores from these organs gave rise to the typical pycnidia of *Septoria linicola* in culture, preceded by the formation of free conidia of the *Septogloeum* stage. These are cylindrical and similar to the pycnospores but are often somewhat larger. In the body of the paper the perfect stage of the flax pathogen is named *Sphaerella linicola* n. sp. [with diagnoses (also of the pycnidial and conidial phases) in Latin and German], but an introductory note explains that, when the article was already in print, it was discovered that the name *Mycosphaerella linicola* had previously been applied to a different fungus with larger perithecia attacking the same host in the U.S.S.R. [ibid., v, p. 611]. In conformity with the recent acceptance of the generic name *Sphaerella* in place of *Mycosphaerella* [ibid., xvii, p. 841], the latter organism is renamed *S. linicola* (Naoum.) Wr. n. comb.; in order to avoid confusion, therefore, the author changes the name of his fungus to *S. linorum* n. sp.

The caulicolous, scattered, rarely aggregated, almost black, erumpent perithecia are approximately spherical to oval, rarely bulb-shaped, mostly 70 to 100 by 60 to 90 (extreme limits 40 to 130) μ (mean 90 by 74 μ), occupied by numerous fasciculate, oblong to clavate or subcylindrical, sessile, straight, curved, or tortuous, hyaline asci, 36 to 55 by 7 to 10 (43 by 8·5) μ, containing eight irregularly biseriate, obliquely uniseriate, or asymmetrically distributed, hyaline, fusiform, mostly curved, septate ascospores, 11 to 17 by 2·5 to 4 (13·4 by 3·3) μ.

DEARNESS (J.). **Sphaceloma rosarum as Gloeosporium rosaecola.**—*Mycologia*, xxx, 5, pp. 561–562, 1938.

The name *Gloeosporium rosaecola* Dearn. & Barth., for a fungus on roses collected in August, 1928, at Stockton, Kansas, was included without description in the list of Kansas fungi published in *Trans. Kans. Acad. Sci.*, xxxiii, pp. 82–83, 1930. Later the fungus was thought to be identical with *Sphaceloma rosarum* [*R.A.M.*, xvii, p. 683] and this has been confirmed by Dr. Anna E. Jenkins to whom specimens were sent.

VAN EEK (T.). **Root-rot of Viola tricolor maxima Hort.**—*Phytopath. Z.*, xi, 3, pp. 217–281, 3 pl., 11 figs., 7 graphs, 1938.

This is an English translation of the author's Dutch thesis on the root rot of cultivated pansies (*Viola tricolor*) in Holland, associated with numerous fungi, including *Pythium de Baryanum*, *P. aphanidermatum*, *P. perniciosum*, *Brevilegnia gracilis*, *Fusarium culmorum*, and *Rhizoctonia* [*Corticium*] *solani*, a notice of which has already appeared [*R.A.M.*, xvi, p. 813].

DOIDGE (E[THEL] M.). **A common disease of Dahlias.**—*S. Afr. hort. J.*, i, 1, p. 12, 1938.

Attention is drawn in a brief, popular note to the increasing prevalence in South African gardens of tomato spotted wilt on dahlias

[*R.A.M.*, xvii, p. 443], and directions given for its control by simple cultural precautions.

MIDDLETON (J. T.), TUCKER (C. M.), & TOMPKINS (C. M.). **Pythium disease of fibrous-rooted Begonia.**—Abs. in *Phytopathology*, xxviii, 9, p. 672, 1938.

Bedding plants of the Fire Sea variety of fibrous-rooted begonia at Berkeley, California, and greenhouse plants of Carmine, Christmas Cheer, and Primadonna at Columbia, Missouri, were affected by a disease causing discoloration, water-soaking, and flaccidity of the crowns, stem bases, and leaves, sometimes followed by collapse of the stem and abscission of the infected foliage. When potted plants were grown close together the disease spread by means of the leaves to a serious extent. Isolations from the Californian material yielded *Pythium ultimum*, while *P. de Baryanum* [*R.A.M.*, xii, p. 448], *P. splendens*, and *P. ultimum* were obtained from the Missouri plants. All the species were pathogenic in inoculation experiments through the soil to the begonia varieties mentioned.

FERRARIS (T.). **L'avvizzimento o tracheomicosi dell' Astro della China.** [Wilt or tracheomycosis of China Aster.]—*Riv. agric., Roma*, xxxiv, 788, pp. 287–288, 1938.

In this brief, popular note on the symptoms and control of wilt of China asters (*Callistephus chinensis*) due to *Fusarium conglutinans* var. *callistephi* [*R.A.M.*, xvii, p. 297], the author recommends that at transplanting all plants showing the least trace of infection in the region of the collar should be discarded and the remainder steeped from the roots to the collar in a solution of iron sulphate (1 per cent.) plus slaked lime for 15 to 30 minutes. The soil should be disinfected before planting by the addition of a finely ground mixture of quicklime and iron sulphate, or, better still, it should be treated with the complete fertilizer 'ferfor' (Caffaro) [ibid., xvii, p. 612] which rapidly suppresses soil-borne fungi.

KILLIAN (C.). **Le développement du Lasiobotrys lonicerae (Kunze).** [The development of *Lasiobotrys lonicerae* (Kunze).]—*Ann. Sci. nat., Bot.*, Sér. X, xx, 2, pp. 241–259, 30 figs., 1938.

A cytological study is fully described of the development of *Lasiobotrys lonicerae*, a subcuticular parasite found by the author on the leaves of *Lonicera nigra* in France.

HYNES (H. J.). **Gladiolus scab and its control.**—*Agric. Gaz. N.S.W.*, xlix, 9, pp. 484–486, 490, 3 figs., 1938.

The commonest disease of gladiolus in New South Wales is stated to be bacterial scab (*Bacterium marginatum*) [*R.A.M.*, xvi, p. 180]. The planting of healthy stock in infected land in July to September generally results in far heavier infection of the new corms than is the case when planting is done in November to February. This indicates a low temperature optimum for infection of the corms and cormlets. The disease is generally most severe under wet conditions.

Very satisfactory control results from immersion of the corms for 8 hours in mercuric chloride (4 oz. in 25 gals. water) or for 10 minutes

in the same with 2 pints of commercial hydrochloric acid added, or for 5 to 10 minutes in a suspension of mercurous chloride (1 oz. to each 1½ pints water used). After any of these treatments the corms should be dried and stored in a dry, well-ventilated place until required. Crop rotation assists in control, and when treated corms must be planted in infected land, they should be planted between October and February, under the conditions prevailing locally. Five or six weeks after flowering has ceased, the plants should be dug and placed in a sheltered spot to dry off before separating the new corms for storage. All old trash should be burnt.

Elisei (F. G.). **L'Alternaria solani (Ell. et Mart.) Sorauer parassita delle foglie di Gerbera jamesoni Bolus.** [*Alternaria solani* (Ell. & Mart.) Sorauer, parasitic on the leaves of *Gerbera jamesoni* Bolus.] —*Atti Ist. bot. Univ. Pavia*, Ser. IVa, x, pp. 217–224, 5 figs., 1938. [Latin summary.]

During recent years nearly all the *Gerbera jamesoni* plants in the botanical gardens at Pavia have shown well-defined, reddish to wine-coloured, zonate spots on the leaf blades, and occasionally on the leaf stalks. When red, the spots shade off at the edge. They dry up from the centre towards the periphery, at the same time turning light, later dark, chestnut. At first they are only about 1 mm. in diameter, but enlarge to about 1 cm. and sometimes become confluent.

Conidiophores and conidia of a fungus identified as *Alternaria solani* were present on the spots. The conidia measured 50 to 80 by 10 to 15 μ, apart from the cylindrical, occasionally bifid or trifid appendage measuring 50 to 200 by 2 to 3 μ. The fungus was successfully isolated [but no inoculations are reported].

Elisei (F. G.). **Sopra una nuova varietà di Cercospora decolor Pass. (var. macrospora El.) e sull' Ascochyta boehmeriae Woron. in Italia.** [On a new variety of *Cercospora decolor* Pass. (var. *macrospora* El.) and on *Ascochyta boehmeriae* Woronich. in Italy.]—*Atti Ist. bot. Univ. Pavia*, Ser. IVa, x, pp. 225–231, 3 figs., 1938. [Latin summary.]

The first part of this paper deals with a leaf spot on *Martynia lutea* growing in the botanical gardens at Pavia caused by a new variety of *Cercospora decolor* named var. *macrospora* Elisei [with a Latin diagnosis].

The second part refers to a leaf spot of *Boehmeria nivea* observed in the summer and autumn of 1937 on plants growing at Pavia. The dark, fuliginous, sometimes rather ashy, irregular or almost circular, zonate spots over 2 cm. in diameter, bore subepidermal, yellowish, ostiolate pycnidia measuring 85 to 130 μ in diameter at the base. Each pycnidium produced numerous hyaline, almost cylindrical conidia, rounded at the ends, mostly with one median septum, occasionally with two or three transverse septa, and measuring 7 to 12 by 2·5 to 3·5 μ. The fungus is considered to be *Ascochyta boehmeriae* Woronichin (1924) [*R.A.M.*, iv, p. 245], with which *A. boehmeriae* Watanabe (1935) [ibid., xiv, p. 512] is probably synonymous.

Rodionova (Mme S. M.). Зараженность семян Клевера и результаты испытания протравителей. [Infection of Clover seeds and results of testing disinfectants.]—*Pl. Prot., Leningr., 1938*, 16, pp. 114–118, 1938.

A laboratory analysis of 24 samples of seeds of red, white, and Swedish clover [*Trifolium pratense*, *T. repens*, and *T. hybridum*] from several communal farms in northern U.S.S.R. showed that an average of 62·4 to 99 per cent. of the seeds were infected, from 0·6 to 52 per cent. by bacteria [unspecified], from 0 to 32·6 per cent. by species of *Fusarium* [unspecified], and from 25·5 to 98 per cent. by moulds (chiefly *Mucor* and *Alternaria*). Disinfection with potassium permanganate considerably reduced but did not eliminate infection, indicating that some of the organisms are carried internally. The infected seeds showed poor germination (30 per cent.) and their dry weight was only 71·2 per cent. of that of healthy seeds. Of the fungicides tested in the laboratory the best results were obtained with mercurized aniline (meranin) [*R.A.M.*, xvii, p. 440], dry (2 kg. per ton) or wet (1 in 500 for one hour), which reduced the infection in red clover from 98 per cent. in the control to 0·3 and 9·8 per cent., respectively, and raised the rate of germination from 39 per cent. in the control to 75·8 and 86·3 per cent., respectively; similar good results were obtained with white and Swedish clovers. The next best results were given by granosan, while nivarsin, talcarsin, and calcium hypochlorite reduced the incidence of infection by 33 to 69 per cent. and did not impede germination.

Minyaeva (Mme O.). О диагностических признаках и распространении цветочной плесени красного Клевера. [Diagnostic characters of the anther mould of Red Clover and its distribution within the host.]—*Pl. Prot., Leningr., 1938*, 16, pp. 110–113, 1938.

A comparative study on the anther mould of red clover [*Trifolium pratense*] caused by *Botrytis anthophila* [*R.A.M.*, xvii, p. 440] showed that diseased plants are of the same height as healthy ones, but lighter in weight and with fewer stems and heads. The colour of the heads cannot serve as a diagnostic character as pale-coloured heads occur both in diseased and healthy plants, and the disease can only be recognized with certainty from the typical grey colouring of the anthers, the opening of two or three flowers and two or three buds from the same head being considered necessary for a reliable diagnosis. Anatomical analysis of the seeds from diseased plants revealed a greater percentage of infected seeds than indicated by the biological method, and showed that in the case of primary infection developing from infected seed the mycelium is present in all parts of the plant, often forming coils in the cells of stems and flower stalks. In infected seeds the mycelium can be best detected in sections cut parallel to the cotyledons, where it can be seen in the parenchyma tissue under the seed coat and especially near the future radicle. It can only be seen after thorough staining and differs from the mycelium in other parts of the plant by the hyphae being slightly thicker and sometimes forming thick-walled bodies, possibly a resting stage of the fungus. The amount of mycelium present varies, being largest in the poorly developed, brown seeds. In the case of secondary infection in the field the attack is confined to the

flower, and in artificial inoculations of the stem the fungus remained localized, rarely penetrating into the deeper layers of tissue.

Richter (H.). **Lupinenkrankheiten.** [Lupin diseases.]—*Mitt. biol. Anst. (Reichsanst.), Berl.*, 58, pp. 87–101, 18 figs., 1938.

A semi-popular account is given of the principal diseases affecting lupins in Germany, namely, foot rot (*Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xv, pp. 101, 586], *Thielavia* [*Thielaviopsis*] *basicola* [ibid., xvii, p. 115], and in all probability *Pythium* spp.); wilt (*Fusarium oxysporum*), occurring on *Lupinus luteus* only; stem-browning, due to a virus [ibid., xvi, p. 680]; leaf fall (*Macrosporium* [*Stemphylium*] *sarcinaeforme*) [ibid., xvii, p. 185 and below, p. 141] (only on *L. angustifolius* both in nature and inoculation experiments); brown spot (*Ceratophorum setosum*) [ibid., xvii, p. 824], chiefly attacking *L. albus*; and two macroscopically indistinguishable rusts (*Uromyces renovatus* [ibid., vi, p. 732; xvi, p. 207] and *U. lupinicolus*), the former characterized by uredospores averaging 22·3 by 21·2 (19 to 26 by 18 to 24) [misprinted as '21' in original] μ, and teleutospores 20·2 by 17·6 (18 to 24 by 15 to 21) μ, while the corresponding dimensions of the latter are 23 by 19 (19 to 27 by 15 to 23) μ and 20·9 by 16·2 (14 to 35 by 13 to 22) μ.

Kidd (F.) & West (C.). **Spotting and other effects on Apples in storage due to volatile products from ripe Apples of other varieties stored with them.**—*J. Pomol.*, xvi, 3, pp. 274–279, 5 pl., 1 graph, 1938.

In order to study certain disorders which have been previously observed to occur when ripe apples were stored together with later maturing apple varieties, the authors placed the test varieties Bramley's Seedling, King Edward VII, and Laxton's Superb in pre-climacteric condition in store with ripe Worcester Pearmain and James Grieve. The storage temperature was 39° F. In parallel series of experiments fruit was stored in air (artificially mixed gases) and in gas (10 per cent. carbon dioxide+10 per cent. oxygen+80 per cent. nitrogen) in gas-tight metal cabinets through which the gas mixtures were passed at a rate sufficient to prevent any appreciable rise in the concentration of carbon dioxide. For each experiment three cabinets were used, the first containing trays of test varieties alone, the second trays of test varieties alternating with trays of Worcester Pearmain, and the third trays of test varieties alternating with trays of James Grieve. Furthermore, the fruit was partly unwrapped or wrapped in oiled paper. Included in the series with fruit stored in gas was also a test of the effect of ethylene, added to the storage atmosphere for three weeks at a rate of 1 part in 500. All fruit was removed from storage about four months later and the examination revealed the following results. Bramley's Seedling showed severe lenticel spotting [*R.A.M.*, x, p. 467] in the cabinets containing either of the two ripe varieties, Worcester Pearmain apples causing a more pronounced spotting than James Grieve, while the control apples in air and in gas were practically free from this kind of injury. The wrapped fruit suffered less than unwrapped. Bramley's Seedling treated with ethylene showed severe spotting identical in appearance with that caused by the presence of the ripe fruit, but oiled wrappers made no

difference. Essentially similar results were obtained with Laxton's Superb, in which case both ripe varieties were equally injurious. No spotting developed on the variety King Edward VII under any of the storage conditions tested. At the end of the experiment the two ripe varieties were naturally overripe but showed few or no signs of spotting. The small amount of superficial scald [loc. cit.] which developed on Bramley's Seedling under gas but not under air storage conditions was not in any way influenced by the presence of the ripe apples or ethylene. Considering the fact that ethylene and the vapours from ripe apples produced the same spotting on stored fruit and that it may be assumed from the results of recent research by Gane (*J. Pomol.*, xiii, p. 35, 1935) that the vapours of ripe apples contain ethylene, the authors are inclined to conclude that the spotting was due in both cases to the presence of this gas.

Askew (H. O.), Thomson (R. H. K.), & Chittenden (E.). **Effect of borax top-dressing on boron status of soil and fruit.**—*N.Z. J. Sci. Tech.*, A, xx, 2, pp. 74–78, 1938.

Continuing their studies [*R.A.M.*, xvi, pp. 186, 687; xvii, p. 462] on the effect of borax, used as a top-dressing for the control of internal cork of apples [ibid., xvii, p. 690], on the boron status of certain New Zealand (Nelson district) soils and apple varieties, the writers found that surface applications of borax (50 and 100 lb. per acre) penetrated the soil to a depth of at least 30 in. during the three-season period of the trials (from September, 1935, to March, 1938), at the end of which the boron content of the soil in the main root zone was maintained at a level at least twice as high as that of the control areas. In each of the three seasons the boron content of the fruit from the top-dressed areas was substantially higher than that of the controls. For instance, in 1938 the boron contents (p.p.m.) of Delicious, Sturmer, and Ballarat apples receiving 50 lb. borax per acre (one application) were 29·5, 31·0, and 23·0 as compared with 17·0, 24·0, and 9·0, respectively, for the untreated controls; in 1937, Jonathans given 100 lb. per acre contained 17·3 p.p.m. boron as against 9·8 untreated, while in 1936, 1937, and 1938 Dougherty supplied with borax at the rate of ½ lb. per tree contained 15·1, 12·0, and 10·5 p.p.m., respectively, the contents of the controls being only 3·9, 4·1, and 6·0, respectively. In view of the heavy loss of borax from the soil by leaching out (a year after treatment the content in the top soil was reduced to about one-tenth of that present immediately after dressing), small annual applications may well prove more economical than the relatively heavy periodical doses used in these investigations.

Atkinson (J. D.). **Residual effect of boron soil dressings on internal cork of Apples.**—*N.Z. J. Sci. Tech.*, A, xx, 2, pp. 90–91, 1938.

Recent observations on plots of Sturmer and Washington apples treated against internal cork with borax and boric acid at the rates of ¼, ½, 1, 2, and 4 lb. per tree in the autumn of 1935 in the Nelson district of New Zealand [*R.A.M.*, xvi, p. 261 and preceding abstract] showed that the three smaller doses of the latter compound had lost much of their remedial action, especially on Sturmers. The effects of borax

were more lasting, even the ½ lb. rate giving practical control during the three years covered by the tests.

ATKINSON (J. D.). **The effect of boron on bitter-pit of Apples.**—*N.Z. J. Sci. Tech.*, xix, 7, pp. 461–463, 1937.

Experiments on the control of bitter pit in the susceptible Cox's Orange apple [*R.A.M.*, xvii, p. 691] in the Nelson and Hawke's Bay districts of New Zealand in 1935 and 1936–7 by top-dressings of borax (¼ to 4 lb. per tree) and the injection of dilute solutions (2, 4, or 8 gm. in 2,000 c.c. water per tree) of borax, boric acid, and sodium perborate were unsuccessful, samples of both treated and untreated fruit showing 80 to 96 per cent. disease in the former year and 87 to 98 in the latter. These results are regarded as corroborating previous observations as to the different etiology of bitter pit [ibid., xvi, p. 262] and internal cork, the latter disorder responding by a marked improvement to boron treatments [see preceding abstracts].

ESBJERG (N.). **Forsøg med Opbevaring af Aebler. I. Foreløbig Beretning om Forsøg med forskellige Lagre, uden og med forskellig Nedkøling.** [Experiments in Apple storage. I. Preliminary report on experiments with different kinds of storage rooms, with and without different methods of cooling.]—*Tidsskr. Planteavl*, xliii, 2, pp. 310–336, 1938. [English summary.]

This is a fully tabulated account of experiments to determine the effect of storage conditions and cooling methods on the health of apples in Denmark. Both in 1936–7 and 1937–8 large fruits tended to develop more scald [*R.A.M.*, xvii, p. 691], Jonathan spot [ibid., xvii, pp. 443, 463], bitter pit [see preceding abstract], and internal breakdown [ibid., xvii, pp. 399, 462] than smaller ones. The average incidence of scald in the eight varieties tested under nine different conditions was 6, 3·8, 1·3, 3·8, 2·5, 3·6, 19·2, 10·3, and 5·4 per cent., respectively, for (1) storage at 3·5°, (2) 2·5°, and (3) 1·5° C. (air renewed by ventilation twice weekly), (4) 2·5° (renewed air), (5) 2·5° (cooling delayed 10 days), (6) 2·5° (cooling delayed 20 days), (7) air-cooled storage, (8), the same preceded by 10 days' cooling at 2·5°, and (9) the same preceded by 20 days' cooling at 2·5°. Under the same nine conditions, the average incidence of Jonathan spot was 0·7, 0·5, 0·3, 0·5, 1·2, 5·3, 21·3, 11·6, and 6·1 per cent., respectively, that of bitter pit 4·1, 6·4, 8·4, 6·4, 3·8, 2, 2, 2·5, and 4·7 per cent., respectively, and that of internal breakdown 0·1, 0, 0·1, 0, 0·2, 0·2, 0, 0, and 0·1 per cent., respectively.

In 1936–7 the maximum incidence of fungal rots, e.g., *Gloeosporium album* [ibid., xvi, p. 820], *Botrytis cinerea*, *Penicillium*, and *Monilia* [*Sclerotinia*], was 5·4 per cent. in Codlin Springrove stored at 2·5° with 20 days' delay and the minimum (nil) in Pederstrup stored at the same temperature without delay. In 1937–8 the maximum of 6 per cent. occurred in Cox's Pomona stored at 2·5° after 20 days' delay and the minimum (0·2 per cent.) in Bellefleur de France at 1·5° with renewed ventilation.

The highest average percentage (91·8) of flawless fruits was found in the consignment stored at 2·5° after 10 days' delay.

Weber (Anna). **Aeblesygdomme i Lagerrum.** [Apple diseases in the storage room.]—*Tidsskr. Planteavl*, xliii, 2, pp. 337–345, 12 figs., 1938.

This is a description in popular terms of the following diseases liable to affect stored apples in Denmark [cf. preceding abstract]: bitter pit, Jonathan spot, scald, internal breakdown, kernel rot (including brown heart), scab (*Venturia inaequalis*), brown rot (*Monilia* [*Sclerotinia*] *fructigena*), *Gloeosporium album*, *Trichothecium roseum*, *Penicillium expansum* and other *P.* spp., and *Botrytis cinerea*.

Häusermann (Elsi) & Thomas (E. A.). **Über ein Russfleckenvorkommen auf Aepfeln in der Gegend von Zürich.** [On a soot spot infection of Apples in the Zürich district.]—*Ber. schweiz. bot. Ges.*, xlviii, pp. 325–328, 2 figs., 1938.

From brownish-black, extremely tenacious spots on Landsberg Rennet apples near Zürich the writers isolated *Cladosporium herbarum* [*R.A.M.*, x, p. 675] in pure culture, and inoculated three fruits each of Winter Citron, Bohn, and an undetermined variety by spraying with a suspension of the spores in 8 per cent. malt extract. Typical spots developed on all the treated fruits, but only on the areas covered by drops of the nutrient solution, and the authors conclude that extraneous impurities, such as honey-dew, are necessary for infection in nature. Scrupulous attention to the cleanliness of the fruit would thus appear to be an effective measure of control for these unsightly blemishes.

Oserkowsky (J.) & Thomas (H. E.). **Exanthema in Pear, and copper deficiency.**—*Plant Physiol.*, xiii, 3, pp. 451–467, 4 figs., 1938.

Exanthema of Bartlett pear trees in central California [*R.A.M.*, xiii, p. 172] starts in late May or early June as a brown discoloration and necrosis of the extreme tips of the shoots and terminal leaves. The dying-off progresses downwards during the season and by the end of the summer three-quarters or more of the current year's growth may be killed. The dead leaves usually fall, leaving the shoots entirely denuded. The same process is repeated annually and may result in extreme degeneration or death. Diseased trees are liable to develop a dense, bushy habit, simulating witches' broom, in consequence of the stimulus to shoot growth from the axillary buds afforded by the death of the apical shoots. The bark of older branches is somewhat roughened due to a limited formation of excrescences. Affected trees bear practically no fruit. Foliar necrosis proceeds from the tip and margin towards the centre, the dead portion exhibiting alternate brown-orange striation running parallel with the outline of the leaf; this symptom is peculiar to pears, which do not, on the other hand, show typical chlorosis, though the green part of leaves with severe marginal burning may be slightly faded.

The copper content of leaves and shoots from trees in the affected area was found to be invariably lower (average 4 p.p.m.) than that from samples obtained in disease-free localities (minimum 10 p.p.m.). Effective control was secured by the incorporation of small doses of copper salts with the soil or their introduction into the root crowns, as well as by spraying with Bordeaux mixture. The response of the

trees to trunk treatments with copper sulphate, copper chloride, and copper nitrate was particularly rapid and striking, but a gradual improvement also followed injections of the less water-soluble copper carbonate, copper phosphate, and copper tartrate, and applications of copper sulphate crystals round diseased trees within a radius of a few feet from the trunk and incorporated in the top soil. The specifically remedial property of the copper salts in the correction of exanthema was demonstrated by the fact that similar treatments with those of other heavy elements were unavailing.

Hewitt (W. B.) & Leach (L. D.). **Species of Sclerotinia causing brown rot of deciduous fruits in California and their distribution.**—Abs. in *Phytopathology*, xxviii, 9, p. 670, 1938.

Of recent years brown rot, formerly largely confined to blossom- and twig-blighting of apricots, almonds, cherries, and prunes, has been much in evidence on peach fruit in the interior valleys of California. On 3rd March, 1936, apothecia of *Sclerotinia fructicola* [*R.A.M.*, xv, p. 592; xvii, p. 256] were found developing from mummified peach fruits in the upper Sacramento Valley, apparently for the first time in the State. *S. fructicola* was compared with cultures isolated from blighted apricot twigs and found to be distinct, the fungus attacking the latter host being identified as *S. laxa* [ibid., xvii, p. 687]. These are the only two species of *Sclerotinia* so far revealed by a survey of the stone fruit-growing districts of California.

Wilson (E. E.) & Serr (E. F.). **Preliminary tests to determine effect of arsenite sprays on sporodochia of Sclerotinia laxa and on control of brown rot in blossoms of Almond and Apricot.**—*Phytopathology*, xxviii, 10, pp. 759–760, 1938.

In preliminary tests in California the application to apricot trees, after the appearance of the 'sporodochia' of *Sclerotinia laxa* [see preceding abstract], of sodium arsenite at the rate of 1 lb. in 100 gals. water substantially reduced the germination of the conidia and largely prevented blossom infection. Monocalcium arsenite (4 in 100) plus 4 per cent. of a dormant type petroleum oil emulsion, applied to almond trees before the development of the sporodochia, suppressed their formation to the extent of 96 per cent. and reduced the incidence of blossom infection by 80 per cent., but when the treatment was carried out after the production of the sporodochia the germinability of the conidia was reduced by 97 per cent. and blossom infection by 71 per cent. Zinc arsenite (4 in 100), with or without 4 per cent. oil emulsion, was less effective than the foregoing in preventing the development of conidia, but when applied after their formation at the rate of 3 in 100, it reduced their germinability and the incidence of blossom infection by 90 and 83 per cent., respectively.

Fikry (A.). **The control of Peach mildew.**—*Bull. Minist. Agric. Egypt* 183, 14 pp., 7 pl. (1 col.), 1937. [Received November, 1938.]

Peach trees growing in all kinds of soils in Upper and Lower Egypt are stated to suffer from severe attacks of powdery mildew (*Sphaerotheca pannosa* var. *persicae*) [cf. above, p. 90], one of the most destructive and economically important diseases of the peach in Egypt.

Severity of attack is favoured by a high subsoil water-table, which weakens the trees, by salinity, poor drainage, impermeability, and water-logging of the soil, and by close planting of the trees. Large-scale experiments showed that proprietary and especially home-made lime-sulphur 1 in 10 (preferably with soap, 0·2 to 0·5 per cent.) and amberene [*R.A.M.*, xv, p. 761] 1 to 2 per mille (also with soap) were the best of the fungicides tested in controlling peach mildew on both the fruits and the foliage without causing damage to trees. Bordeaux and Burgundy mixtures gave satisfactory control of the disease on the leaves but not on the fruits. The first application should be made immediately after the outbreak of the disease, and it is usually necessary to apply two more sprays at intervals of three weeks. It was found in the course of these trials that amberene (2 per mille) with soap (4 per mille) also controlled aphids, and should these results be confirmed in further tests great economy of cost and labour could be achieved by the combined action of this fungicide.

Adam (D. B.). **A progress report on a gummosis (dieback) disease in South Australian Apricot trees.**—*J. Dep. Agric. S. Aust.*, xlii, 1, pp. 14–29, 9 figs., 1938.

Further investigations into apricot gummosis associated with a species of *Cytosporina* in South Australia [*R.A.M.*, xvi, p. 516] showed that in advanced infections the death of an affected limb occurs with great suddenness. An apparently healthy, though in reality badly affected, branch may wilt completely in a week, such wilting usually taking place when the tree is growing vigorously and the fruit is half formed. If infection occurs near the top of the tree in two- to three-year-old wood, the branch may wither 15 to 18 months later; if, however, infection occurs near the butt, many years may pass before sudden collapse. In many instances, the lowest point of penetration of the fungus in the wood is not indicated by any external symptom. After some time small, flattened pycnidia generally form just beneath the periderm, or occasionally on the wood where a dead branch has been cut off.

Inoculations with the mycelium or spore suspensions of the fungus isolated from diseased material into wounded apricot trees of different varieties gave positive results in over 50 cases, the fungus being re-isolated from the diseased area in a representative number of instances. Inoculations of uninjured bark gave negative results. The mycelium was a more effective inoculum than a spore suspension, but success also depended on the depth of the wound. The data showed that pruning cuts exposing a large section of wood provided a favourable site for infection; the fungus was also able to spread through deep bark wounds or the cut ends of smaller branches. None of the varieties commonly grown in South Australia appeared to be immune, but some, notably Tilton, showed resistance to infection by artificial inoculation.

It is considered that some modification in the pruning methods in vogue locally may possibly afford a means of control, while tests of winter sprays are also in progress. A common fault in treating affected trees is the failure to cut low enough to eliminate the disease.

[This paper also appeared in *Fruit World, Melbourne*, xxxix, 9, p. 22; 10, pp. 29–30, 35, 1938.]

WORMALD (H.). **Bacterial diseases of stone fruit trees in Britain. VII. The organisms causing bacterial diseases in sweet Cherries.**—*J. Pomol.*, xvi, 3, pp. 280–290, 2 pl., 1938.

In further experiments with *Pseudomonas prunicola* and *P. mors-prunorum*, the causal agents of bacteriosis of cherries [*R.A.M.*, xvi, p. 691], about 80 isolations were made from cankers on stems, branches, and twigs, lesions on young shoots, dead buds, and leaf and fruit spots of cherry trees. The two bacteria were readily distinguished by the following methods. From plates of nutrient agar with 5 per cent. saccharose, incubated for 48 hours at 25° C., the colonies of the two organisms were transferred to nutrient broth containing 5 per cent. saccharose and examined by reflected light against a dark background. The cultures of *P. prunicola* had a slight yellowish tinge and were more or less translucent, while those of *P. mors-prunorum* were white and somewhat opalescent. In the longevity test transfers of *P. prunicola* from six-day-old cultures on nutrient agar with 5 per cent. saccharose incubated at 25° to nutrient broth resulted in visible growth within one or two days, whereas transfers of *P. mors-prunorum* produced no growth since the organism was clearly dead. In a further test cultures on nutrient agar containing 2 per cent. lactose and bromo-cresol-purple as indicator, the initial alkaline reaction persisted in cultures of *P. prunicola* but in those of *P. mors-prunorum* the reaction became reversed.

In controlled inoculation experiments about 30 of the strains isolated produced definite lesions on the leaves, shoots, branches, and stems of the cherry trees; 15 of the most successful experiments carried out at various times between 1925 and 1932 are described in detail. Strains of both bacteria isolated from lesions on various parts of the cherry tree were able to infect other parts. The organisms pass the winter and spring in the stems and branches, producing lesions from which cankers develop during the summer. The bacteria within these cankers die out in summer, but meanwhile the leaves become infected and carry the organisms over in leaf spots until the autumn, when they again infect the branches and stems. In cross-inoculation experiments, generally speaking, strains of both bacteria isolated from plum [ibid., xvii, p. 693] proved to be more virulent on their own host than on cherry, while those derived from cherry were more injurious to cherry than to plum. The negative and inconclusive results of some of the experiments indicate that the degree of infection following inoculation is greatly influenced by the physiological condition of the tree. The conditions favouring or checking infection of the branches and stems have not yet been determined, but the infection of leaves and shoots seems to be undoubtedly favoured by wet weather.

ROOS (K.). **Das Kirschbaumsterben im Baselland. 1. Mitteilung: die Erscheinungsformen der Krankheit.** [The dying of Cherry trees in the Basle district. Note 1: the symptoms of the disease.]—*Landw. Jb. Schweiz*, lii, 5, pp. 596–617, 33 figs., 2 graphs, 1 map, 1938. [French summary.]

The present paper is the outcome of investigations undertaken by the Wädenswil Experiment Station into a new serious disease of cherry

trees, which occurs in many communities of the canton of Basle (but not in the higher districts), and especially in Aesch and Pfeffingen, where the disease first appeared about 1890 and has since considerably reduced the cherry orchards, though these still form one of the chief sources of income for the inhabitants. A survey of 4,282 cherry trees in the Aesch-Pfeffingen district revealed the presence of 82 per cent. healthy, 7 per cent. doubtfully infected, and 11 per cent. diseased trees. The local growers believe the disease to be infectious, since it spreads noticeably directly after regeneration. During the winter the young shoots of diseased trees measure only a few centimetres, the buds are closely aggregated, and in extreme cases the length of a diseased shoot with 32 buds equals the distance between two buds in a normal shoot. In the spring the young shoots appear light brown from a distance, their growth is arrested at the beginning of vegetation, so that they need about 14 days more for the first signs of growth and 14 days longer to reach the blossoming stage than those of a healthy tree. The leaves are shorter, narrower, and more pointed than healthy ones and often develop a dark green callus growth on their lower surface. The fruits are smaller, elongated, grow on short fruit stalks, and usually fall in June. At the normal time of ripening the diseased fruits are green with red spots and have no flavour. Some ripen later and become abnormally large but remain poor and watery in taste. The disease usually begins with the appearance of the typical pointed leaves on one of the branches, spreading farther each year. Often healthy and diseased parts are found on the same branch or even shoot. The cause of the disease has not yet been determined.

Bain (H. F.) & Demaree (J. B.). **Isolation of the fungus causing the red stele or red core disease of Strawberries.**—*Science*, N.S., lxxxviii, 2276, pp. 151–152, 1938.

In November, 1937, some 50 per cent. of a number of washed, decorticated pieces of strawberry roots affected by the red stele or red core disease [*R.A.M.*, xvii, p. 759] in Maryland yielded a species of *Phytophthora* in pure culture on water agar, which was, however, only obtained from 4 out of 45 isolations made by H. W. Anderson in Illinois in March, 1938, the remainder giving rise to a *Pythium* evidently following closely on the *Phytophthora*.

Under greenhouse conditions inoculation of the roots with a zoospore suspension of the latter fungus caused wilting in three weeks, by which time the root systems were almost entirely destroyed, showing the typical symptoms of natural infection. The organism was recovered in pure culture from the reddened steles of the larger roots. Uninoculated control plants remained healthy.

The exact identity of the strawberry *Phytophthora* is still under investigation: at present it can only be placed in the group characterized by larger non-papillate sporangia, relatively large oospores, and predominantly amphigynous antheridia. Oatmeal agar and canned pea broth are the best of the media tested, somewhat less rapid growth being made on Lima bean agar. Sporangia and zoospores develop in profusion on small blocks of mycelium grown in thin layers of Lima bean agar under shallow irrigation with cool tap water. The temperature

range of the fungus is comparatively low; the mycelium is killed in a week at 30° C. and zoospores are produced at 10° but inhibited at 22°, the optimum for development extending from 14° to 18°. Zoospore dispersal, together with mechanical distribution of diseased plant material, constitutes the main agency of spread of infection in the field.

The zoospore and sporangial dimensions of the American red stele organism fall well within the range reported for the *Phytophthora* [allied to *P. cinnamomi*] associated with the Lanarkshire disease in Scotland, and since the symptoms are largely similar, the two disorders may well be identical.

Ferrer (R. B.). **El control de la 'Sigatoka' del Banano.** [The control of 'Sigatoka' of the Banana.]—*Bol. Coop. Banan. Magdalena Lim., Colombia, 1938*, 7–8, pp. 7–19, 14 figs., 1938.

This is a full discussion of the economic, technical, and practical aspects of the control of 'Sigatoka' disease of bananas (*Cercospora musae*) [*R.A.M.*, xvii, p. 760] in Mexico [ibid., xvii, p. 720], Honduras [ibid., xvi, p. 195], Guatemala, and Colombia, with reference in each case to local conditions and requirements. Spraying with 5–5–50 Bordeaux mixture or 20–80 copper-lime dust is generally recommended.

Alvarado (J. A.). **¿Es la sigatoka una enfermedad susceptible de curarse por sí sola y sin tratamiento alguno?** [Is 'sigatoka' a disease susceptible of spontaneous cure without any treatment?]—*Rev. Agric., Guatemala*, xv, 4, pp. 214–220, 1938.

The writer advocates a strenuous campaign for the eradication of 'sigatoka' disease of bananas (*Cercospora musae*) which has now appeared in Guatemala [see preceding abstract].

Briant (A. K.). **Report on the Agricultural Department, St. Vincent, for the year ended December 31st, 1937.**—43 pp., 1938.

Cercospora disease of bananas [*C. musae*: see preceding abstract] was first recorded in St. Vincent in September, 1937, from an estate on the Leeward Coast. Since then it has been found on another estate farther north. The affected areas are not extensive, and only slight damage was caused. Control by burning all infected material is being attempted.

Pollacci (G.), Ciferri (R.), & Gallotti (M.). **Lo zolfo colloidale come preventivo contro le alterazioni dei caschi di Banana.** [Colloidal sulphur as a preventive of injuries to Banana bunches.]—*Atti Ist. bot. Univ. Pavia*, Ser. IVa, x, pp. 257–264, 1938. [Latin and English summaries.]

In experiments carried out in Italy on the prevention of loss (mostly due to *Gloeosporium musarum*) in bananas [*R.A.M.*, xviii, p. 41] dispatched from Italian Somaliland it was found that treatment of the cut surfaces of the rachis, by sprinkling with quicklime or hydrated lime before inoculation with *G. musarum* and incubation at 20° to 25° C. in a saturated atmosphere, resulted in slight retardation of infection only. Sprinkling the cut surfaces before or after inoculation with Caffaro powder and dipping the pieces in Bordeaux mixture (1 and 2 per cent.) gave somewhat better results. Painting the surfaces

with colloidal sulphur immediately after inoculation by sprinkling with a spore suspension of the fungus, or after an interval of from 1 to 24 hours, showed that the treatment was most effective when carried out within 2 hours of inoculation. When carried out after 3 hours, it was less effective, and after 8 to 10 it was practically useless.

When whole bunches sprayed with a suspension of the fungus and allowed to dry were dipped for a few seconds in suspensions of colloidal sulphur at various concentrations, the lowest concentration preventing rotting was about 10 kg. per hectol. water. It is recommended that in addition to this treatment the cut ends of the main stalks should be painted with undiluted colloidal sulphur paste. In extensive tests carried out in Italian Somaliland painting the cut ends in this manner gave good control of wastage on arrival in Italy as compared with no treatment and treatment with Caffaro powder, quicklime, and hydrated lime.

ANAGNOSTOPOULOS (P. T.). *Μία νέα ζημία τῶν καρπῶν τῆς φιστικιᾶς (ὑπὸ τοῦ μυκήτος* **Phomopsis sp.**). [Damage to Pistachio fruits caused by the fungus *Phomopsis* sp.]—*Hort. Res., Athens, 1938*, 3, pp. 551–558, 3 figs., 1938. [English summary.]

Pistachio nut (*Pistacia vera*) drupes are stated to suffer heavy damage in Greece from a species of *Phomopsis*, which is active in the spring and autumn, when temperatures below 25° C. and a relative humidity above 55 per cent. prevail. *Tinea pistaciae* acts as a precursor of the disease and other insects aid in its dissemination. Control measures should include the extermination of the insect vectors, destruction of diseased fruits, twigs, and foliage, and preventive treatments with 2–2–100 Bordeaux mixture.

SIMMONDS (J. H.). **Plant diseases and their control.** *ex* **The Queensland agricultural and pastoral handbook. Vol. iii.**—pp. 117–254, 4 pl., 44 figs., Brisbane, David Whyte, Government Printer, 1938.

Part ii of this handbook follows the same general lines as in the older publication 'Pests and diseases of Queensland fruit and vegetables' [*R.A.M.*, viii, p. 660], but the text is considerably enlarged to include most of the common diseases affecting the more important economic hosts and additional information is incorporated to bring the whole up to date. The final chapter deals with the preparation and use of the common fungicides.

STEVENS (N. E.). **Departures from ordinary methods in controlling plant diseases.**—*Bot. Rev.*, iv, 8, pp. 429–445, 1938.

The writer summarizes, with brief explanatory notes, a number of recent examples of plant disease control by newly devised methods based on increasing knowledge of the biological relationships between host and pathogenic agency. Most of the work referred to has been noticed in this *Review* from time to time.

SALAMAN (R. N.). **A discussion on new aspects of virus disease.**—*Proc. roy. Soc.*, Ser. B., cxxv, 840, pp. 291–310, 1938.

In an opening address R. N. Salaman deals with the properties of the six distinct strains of the potato virus X isolated by him in pure

plant cultures, and describes their respective reactions on tobacco and potato, explaining the observed differences by the presence of certain radicles in the virus particles [see below, p. 129]. These hypothetical radicles are linked up with certain serological reactions, radicle 'A' being identified with the flocculating antigen, common to all strains, and radicle 'M' being equated with the neutralizing antigen.

K. M. Smith and W. D. MacClement suggest that the variability in size of virus particles calculated by means of ultrafiltration is due to aggregation of particles after precipitation. They have succeeded, however, in breaking down the aggregates of *Nicotiana* virus 11 (tobacco necrosis virus) by dialysing the virus against tap or distilled water either before or after precipitation, and have consequently obtained the same filtration end point of 45 mμ for both the precipitated and the unprecipitated virus.

F. C. Bawden states that all the viruses so far isolated have some degree of crystallinity, which varies with the different viruses and in some cases with the medium containing the virus.

J. D. Bernal draws the conclusion from his X-ray studies with the tobacco mosaic, cucumber mosaic, potato X, and bushy stunt viruses that the virus particles in the plant consist of flat prismatic protein molecules which attach themselves together very readily in the form of elongated piles, giving rise in this state to liquid crystal phenomena and being amenable to X-ray examination [ibid., xviii, p. 45].

A. S. McFarlane's observations of the virus of vaccinia favour the conception of the virus as a large inert protein particle.

G. M. Findlay expresses the view that certain variations of animal viruses are reversible alterations of the hereditary constitution caused by environmental changes, while others appear similar to the mutations of higher animals and plants.

Marion A. Watson discusses the aphid transmission of some plant viruses and compares the methods of determining the infectivity of the viruses by the starch lesion count and by their transmissibility by the vectors.

P. A. Murphy sums up the practical aspects of virus research for the control of plant diseases and considers protective inoculation with weak virus strains against attacks of more virulent viruses to be potentially dangerous, and the complete absence of all viruses, which appears not unattainable in the light of recent work, to be the more desirable aim.

W. J. Elford suggests that an investigation of the influence exercised by the medium on the dispersion and adsorbability of plant viruses may reveal conditions that are more favourable for filtration than are those obtaining in plant juice.

Jaeger (F. M.). **De analytische ultra-centrifuge en het onderzoek der filtreerbare virus-soorten.** [The analytical ultra-centrifuge in the study of filterable virus types.]—*Chem. Weekbl.*, xxxv, 23, pp. 419–431, 6 figs., 5 diags., 8 graphs, 1938.

This is a highly technical discussion of the theoretical principles and practical applications of the ultracentrifuge to the study of filterable viruses, especially crystalline proteins, such as tobacco mosaic.

MAXIMOV (N. A.). **Plant physiology.**—xxii+473 pp., 132 figs., 12 graphs, London, McGraw-Hill Publishing Company, Ltd., 1938. 25*s.*

This, the second English edition of this work, is a translation and revision made from the fifth Russian edition, and is a completely new book, bringing up to date the results of plant physiological research throughout the world. The work includes a short section (pp. 382–387) dealing with the resistance of plants to fungi, the interrelations of parasite and host, and immunity.

VERONA (O.). **L'alimentazione minerale dei vegetali in rapporto al loro stato di sanità.** [The mineral nutrition of plants in relation to their state of health.]—263 pp., 27 figs., 8 graphs, Pisa, Arti Grafiche Tornar, 1938. L. 40.

In this work the author succinctly reviews and discusses the results of the most important recent research work on the effect of mineral nutrition on plant health, with particular reference to mineral deficiency and excess as affecting yield and susceptibility to disease, including fungal infection. Ten chapters are devoted to the metalloids, and fourteen to the metals. The bibliography extends to 58 pages.

FEDOTOVA (Mme T. I.). Серологический метод в определении сортоустойчивости растений к заболеваниям. [The serological method of determining the varietal resistance of plants to disease.] —*Pl. Prot., Leningr., 1938*, 16, pp. 50–58, 1938.

In further studies on the estimation of the resistance of cotton to *Verticillium dahliae* by the serological method [*R.A.M.*, xv, p. 577; xvii, p. 438], the data obtained from tests on 150 samples from 125 strains of *Gossypium hirsutum*, *G. herbaceum*, and *G. barbadense* agreed in 80 per cent. of cases with the data from field trials. None of the deviations was great, but sometimes strains known from the field trial to be very susceptible or only slightly susceptible were placed in the moderately susceptible group. Isolations of *V. dahliae* from cotton and other plants, but grown on the same culture medium for a year, showed differences, sometimes marked, in the serological reactions induced by the susceptible and resistant strains of cotton.

The resistance of 17 strains of *Phaseolus vulgaris*, *P. acutifolius*, and *P. aureus* to *Bacterium phaseoli* [ibid., xvii, p. 720] was tested by the same method and the results obtained again agreed closely with the data from field trials. It was extremely difficult to obtain reliable field data for this disease and for *Bact. medicaginis* var. *phaseolicola* [loc. cit.] and *Bact. phaseoli* var. *fuscans* [ibid., xvi, p. 85], as they usually occur together, but serological tests indicate that bean varieties have different degrees of resistance to each of the three diseases.

The reliability of the serological method was further confirmed in testing the resistance of 16 strains of flax (*Linum usitatissimum* vars. *elongatum*, *intermedium*, and *multicauleum*) to *Melampsora lini* [ibid., xvii, pp. 441, 530], *Fusarium lini* [loc. cit.], *Colletotrichum lini* [ibid., xvi, p. 386], and *Polyspora lini* [see above, p. 111].

Isakova (Mme A. A.). Опыт применения метода Росси-Холодного к изучению бактериориз у различных растений. [Experimental application of the Rossi-Cholodny method for the study of bacteriorrhiza of various plants.]—*Bull. Acad. Sci. U.R.S.S., 1938*, Sér. biol., 2, pp. 517–522, 1 pl., 1938.

The Rossi-Cholodny method [*R.A.M.*, xvii, p. 554] proved very satisfactory in the author's study on the bacteriorrhiza of peas, lupin, mustard, oats, and wheat [cf. ibid., xvii, p. 303]. In addition to a microscopical examination of stained glass slides, however, cultures of the bacteria were isolated from the slides and grown on various nutrient media. The suitability of the media to the various bacteria [unidentified] is discussed and notes are added about the organisms isolated.

Yarwood (C. E.) & Childs (J. F. L.). **Some effects of rust infection on the dry weight of host tissues.**—*Phytopathology*, xxviii, 10, pp. 723–733, 1938.

The local dry weight per unit area of leaves infected by *Uromyces betae* on beet, *Tranzschelia punctata* [*Puccinia pruni-spinosae*: *R.A.M.*, xvii, p. 756] on prune, *U. phaseoli* [*U. appendiculatus*: ibid., xvii, p. 427; xviii, p. 48] on bean (*Phaseolus vulgaris*), *Puccinia iridis* [ibid., xvii, p. 397] on iris, *P. antirrhini* on *Antirrhinum majus*, *P. helianthi* [ibid., xvi, p. 539] on sunflower, *Phragmidium* sp. on rose, and two other rusts in California was greater than that of corresponding areas on healthy or lightly infected leaves, the differences ranging from −3·0 to +110·0 per cent., with an average of +33 per cent. Anomalous results were obtained in the case of *Melampsora* sp. on poplar.

In 14 tests with paired sunflower leaves or plants, the dry weight of the entire rusted leaves was from 2 to 46 per cent. greater than that of the paired controls. In three tests the green weight and proportion of dry matter of diseased leaves averaged 9 and 15 per cent. more, respectively, than in the case of healthy material.

The reduction in dry weight yield of entire sunflower and Pinto bean plants as a result of rust infection of the primary leaves was associated with a higher yield of diseased than of sound leaves, and lower stem and new growth yields from infected than from healthy plants. In three tests with beans and one with sunflowers, rust infection decreased the diurnal fluctuation in foliar dry weight.

Weindling (R.). **Association effects of fungi.**—*Bot. Rev.*, iv, 9, pp. 475–496, 1938.

In this review of recent investigations which throw light on the principles and mechanism of fungal association effects, emphasis is placed on work concerned with the stimulatory and toxic metabolic products of fungi. The main points dealt with include types of fungous associations, effects of association on morphology and physiology, metabolic products in association effects, substances present in parasitic Mucoraceae and sex responses in this group, accessory substances stimulating growth or sporulation, influence of variation in food supply and environmental conditions, and methods of study. A bibliography of 81 titles is appended.

Alexopoulos (C. J.), Arnett (R.), & McIntosh (A. V.). **Studies in antibiosis between bacteria and fungi.**—*Ohio J. Sci.*, xxxviii, 5, pp. 221–234, 2 pl., 2 graphs, 1938.

In investigations begun in October, 1935, to determine whether bacteria are able to inhibit the growth of fungi when grown in close association with them in culture, *Actinomyces albus* inhibited all the fungi against which it was tested (including *Glomerella cingulata*, *Physalospora cydoniae* [*P. obtusa*], *Gloeosporium musarum*, *Botrytis tulipae*, *Cephalothecium* [*Trichothecium*] *roseum*, *Colletotrichum lindemuthianum*, and *Volutella fructi* [*C. fructus*: *R.A.M.*, xvi, p. 543]) on dextrose agar and maize meal agar; *Bacillus subtilis* inhibited five out of the ten fungi on dextrose agar and eight on maize meal agar; and *Serratia marcescens* [*Bacterium prodigiosum*: ibid., xiii, p. 541] inhibited three fungi on dextrose agar and five on maize meal agar. None of the eight other bacteria exerted any appreciable effect on any fungus. The greatest single amount of inhibition was produced by *B. subtilis* on *T. roseum* on maize meal agar. In every case except one, inhibition, when occurring, was greater on maize meal agar than on dextrose agar. No correlation was established between rate of growth and degree of inhibition. Sterilized filtrates of cultures of *A. albus* produced similar inhibitory effects to those of the living organism. In tests on *C. lindemuthianum* neither food depletion of the medium nor a change in P_H value brought about by *A. albus* was responsible for the inhibition of growth and it would seem probable that the antibiotic phenomena noted are due to the presence of a toxin, which is soluble in water, diffusible through agar, and largely thermostable.

Lilly (V. G.). **Growth substances for fungi.**—*Bull. W. Va agric. Exp. Sta.*, Ser. 38, 3–11, pp. 95–103, 1937. [Abs. in *Exp. Sta. Rec.*, lxxix, 5, p. 175, 1938.]

Following a review of the pertinent literature data are presented showing that garden peas contain a growth-promoting substance for *Phytophthora cactorum* [cf. *R.A.M.*, xvi, p. 199]. In initial purification experiments this substance was found to be thermostable, insoluble in ether, ligroin, and methyl cellosolve, but soluble in alcohol, acetone, carbon tetrachloride, and benzene. The chemical nature of the substance remains to be investigated.

Salaman (R. N.). **The Potato virus 'X': its strains and reactions.**—*Philos. Trans. Roy. Soc.*, Ser. B., ccxxix, 559, pp. 137–217, 8 pl., 2 figs., 5 diags., 2 graphs, 1938.

In studies on potato virus X [see above, p. 126], the author has differentiated 6 strains of the virus based on the results of inoculation experiments with a wide range of plants, conducted under constant conditions of temperature (50° and 70° F.) and high humidity, the inoculum being obtained by punching (and then grinding up with tap water) circular disks of tissue, 4 or later 1 mm. in diameter, taken from the green and the yellow areas on leaves of an artificially infected tobacco plant. The virus originally came from a potato plant and had passed through *Datura stramonium* and then a series of five tobacco plants

before being used as inoculum. The first strain, designated X^H, produces a distinct reaction only on *Capsicum annuum*; on all other plants tested it is masked, but its presence, as demonstrated more than 100 times on over 1,000 plants, protects them from more virulent strains. This strain produces no lesions on tobacco and on only three potato varieties does it cause top necrosis. The mild or X^G strain produces no local lesions on either potato or tobacco, but occasionally a faint mottle on tobacco and a transient interveinal mottle on potato. The medium or X^L strain produces no local lesions on either host, but a yellow mottle, which later develops into a dark tortoise-shell pattern on tobacco, and a mild mottle on potato. The severe or X^S strain produces local lesions in form of rings with small necrotic centres on tobacco, and an interveinal mottle on potato. The X^D strain (Bawden's foliar necrosis) produces a necrotic spotting of the leaves in potato and no local lesions but a mild mottle in tobacco. Previous infection with a weaker strain of X virus protects both potato and tobacco plants against infection with X^D. The strain X^N produces a very severe necrotic mottle on tobacco and an interveinal necrosis on potato, similar to one produced by X^S, followed in most varieties by leaf drop. In the field potatoes are usually infected by two or more strains simultaneously, but single strain infections with X^H and X^N have been observed. Inclusion ('X') bodies, mostly granular and deeply staining but all much of the same character and larger than the nucleus of the cell (up to nearly twice as large), were found in all the six strains. They occurred most commonly in X^H and X^L and rarely in X^D. In raw unclarified juice at room temperature the strains X^H, X^D, X^S, and X^N remained viable for 4 months, and X^G and X^L for 5 months; the particle size was 113 $\mu\mu$ for all six strains; the dilution end-point was 1 in 3,000 for X^H, 1 in 10,000 for X^G, X^L, and X^S, 1 in 5,000 for X^D, and 1 in 100,000 for X^N; and the thermal death point was 70° C. for X^N and 68° for all the other strains.

When plants were inoculated with mixtures of pure strains of the X virus *in vitro*, it was found that a sufficient amount of a mild strain protected the plant from the more virulent strains, thus X^L and X^S were completely masked when 9 and 5 times as much X^G, respectively, was used in the mixture. The intensity of reaction of a mixture of virus Y with any of the strains of virus X on tobacco was found to be in direct proportion to the virulence of the X strain used; similar but less intense and distinct reactions resulted from the mixture of the X strains with potato virus A and tobacco mosaic virus.

Conversion of strain X^S into X^L and X^G was effected by sap inoculations of tobacco and subsequent passages through several generations of the same host; conversion of X^S to X^G was further observed within a pure strain after passages through horse beans (*Vicia faba* var. *minor*), red beets, and sugar beets, and *in vitro* by mixing X^S infected tobacco juice with that of healthy sugar beet. All conversions have been from the more to the less virulent strain. They are believed to be true mutations.

Datura stramonium, tobacco, *Nicotiana glutinosa*, and potatoes artificially inoculated with X^G or X^H were resistant to subsequent inoculations with either X^L, X^S, X^N, or X^D, better protection being secured

when the plants (especially tobacco) were in active growth, so that the protective strain was distributed throughout the plant before inoculation with the virulent one, than in older plants and by allowing an interval between the two inoculations of not less than eight days. Successful protection was, however, readily obtained in older plants of *D. stramonium*. This protective action of mild against more virulent strains was specific to the X strains and was not effective in subsequent inoculations with virus Y and a few other viruses. When the protective virus has been introduced by inoculation in nine cases out of ten the plant is rendered completely immune from a later infection with a virulent strain and in the tenth case the virulent virus is restricted to isolated spots and does not become generalized.

The discovery of the masked X^H strain in certain potato stocks thought to be virus-free suggested that this strain may be present in these apparently healthy stocks. The protection afforded by it against the destructive and easily communicable viruses X^D and X^N indicates that the rarity of the latter in the field may be due to the presence of X^H. The author is convinced that protection of this type has been at work in the field for a long time. Tests of the seedling 41956, raised by the United States Department of Agriculture, showed that no masked strain of X was present and the very real immunity of this seedling from X is apparently of the kind found in the case of wart disease (*Synchytrium endobioticum*) and may be genetic in origin.

In an attempt to explain the phenomenon of protective inoculation the author suggests that such protection is due to a radicle designated 'A', common to all six X strains, which determines the attachment of the virus molecule to the plant protoplast and prevents the subsequent attachment of a second related strain. The reactions of the strains to host plants are also ascribed to radicles, 'M' being responsible for mottle production, 'N' inducing local and systemic necrosis, 'P' causing necrotic foliar lesions on potato only, and 'C', which is inert when alone, producing in company of a like radicle in tobacco mosaic a distinct and lightly necrotic mottle in tobacco. It is suggested that these radicles can be identified with various antigens, as it appears from the serological experiments undertaken by Bawden and Spooner that the strains of X virus have certain antigens in common and others peculiar to each strain. The author considers that an analogy may exist between the particles and the free genes of the cytoplasm rather than the nuclear genes.

SALAMAN (R. N.). **The fight against Potato disease.**—*J. Minist. Agric.*, xlv, 9, pp. 881–889, 1938.

The control of the two most destructive virus diseases of the potato in England, leaf roll and leaf drop streak (caused by virus Y) [*R.A.M.*, xvii, p. 833], lies in the removal of sources of infection (including the removal of infective foci, destruction of carriers other than potatoes, and roguing), the sowing of clean seed, the extermination of *Myzus persicae* [see next abstract], and the use of immune varieties for seed purposes.

The removal of infective foci involves adequate crop rotation and good cultivation to eliminate infected groundkeepers, and cessation of the practice of growing crippled stocks year after year. Solanaceous

weeds, particularly *Solanum nigrum* and *S. dulcamara*, of which the latter may be infected with leaf roll and the former with both X and Y potato viruses, must be completely excluded from potato-growing areas.

The prices of very high-quality, certified stocks of seed potatoes from Cumberland, Scotland, and Ireland are in many cases no higher than those of uncertified, diseased stocks. The supply of first-class potato seed in Great Britain is only about one-third or one-fourth of what it should be if the highest returns compatible with good farming and high wages are to be obtained.

No localities are completely free from *M. persicae*, but there are many wet, windy districts where it is very scarce, and the migration of the winged form is impeded. Heavy rain may relieve a potato crop from infestation for a considerable time, or for a whole season if the weather remains cold and damp. The removal of peach and apricot trees largely eliminates the winter-breeding sexual generation, while winter-spraying, if such removal is impracticable, will kill the sexual forms and eggs, and early nicotine spraying will destroy the winged form. Cruciferous weeds act as temporary hosts of the insect in the early spring and must be removed. As the aphids overwinter on winter cabbage and turnip, potatoes should not be grown near market-gardens. Large-scale tests with insecticidal sprays or deterrent dressings to destroy the aphids on the potatoes are required, but such treatment will probably prove too expensive to be practicable.

The development of immune varieties by planned genetic methods is being considered in England and the U.S.S.R., but does not appear to offer great promise. The only truly immune variety appears to be the American seedling 41,956. The author has produced acquired immunity from leaf drop streak, but the vaccine gave rise to an un desirable reaction. As regards the development of carrier varieties, there are at present none that is not adversely affected by leaf drop streak, but Ulster Monarch and Edgecote Purple may appear almost normal when chronically infected. The Swedish variety, Imperia, is a perfect carrier of leaf roll [ibid., vii, p. 596].

Heinze (K.) & Profft (J.). **Zur Lebensgeschichte und Verbreitung der Blattlaus Myzus persicae (Sulz.) in Deutschland und ihre Bedeutung für die Verbreitung von Kartoffelviren.** [On the life-history and distribution of the aphid *Myzus persicae* (Sulz.) in Germany and its importance in the dissemination of Potato viruses.]—*Landw. Jb.*, lxxxvi, 3, pp. 483–500, 4 figs., 4 graphs, 1 map, 1938.

Attempts at the elimination of virus diseases from German potato stands have hitherto been concentrated mainly on the removal of infected material by roguing. In this paper the writers provide a fresh approach to the problem of control by a description of the life-history and distribution of the principal virus vector, the peach aphid (*Myzus persicae*) [*R.A.M.*, xvii, p. 265; xviii, p. 50] in the country. The control of the aphid by eradicating the commercially unimportant peach and apricot orchards in the vicinity of potato fields and by spraying is briefly discussed.

[A semi-popular account of this work by the first-named author appears in *Dtsch. landw. Pr.*, lxv, 46, pp. 591–592; 47, p. 602, 1938.]

Köhler (E.). **Die Bedeutung der Insekten für den Kartoffelabbau.** [The importance of insects in Potato degeneration.]—*Mitt. biol. Anst.* (*Reichsanst.*), *Berl.*, 58, pp. 29–36, 1 map, 1938.

After emphasizing the important part played by *Myzus persicae* in the transmission of virus diseases of the potato in Germany, and the consequent need for the drastic reduction or at least the effective insecticidal treatment of peach stands in the vicinity of production centres [see preceding abstract], the writer draws attention to the suspected implication of *Aphis rhamni* (*A. abbreviata*) in the dissemination of the A virus [cf. *R.A.M.*, x, p. 747; xiv, p. 496; xviii, p. 50]. Further investigations on this point are urgently required, while fuller knowledge of the migratory phases both of *M. persicae* and *A. rhamni* will facilitate insecticidal operations on the peach and the field spraying of potatoes [see next abstract].

Störmer. **Die praktische Bekämpfung der Viruskrankheiten bei der Kartoffel.** [The practical control of virus diseases in the Potato.]—*Mitt. biol. Anst.* (*Reichsanst.*), *Berl.*, 58, pp. 37–46, 4 figs., 1938.

For practical control purposes the virus diseases affecting the German potato crop may be divided into two groups, (1) comprising those transmitted by the peach aphid [*Myzus persicae*: see preceding abstracts], namely, leaf roll, streak, and the A virus, and (2) represented by the X viruses, the mode of transmission of which has not yet been elucidated [but see *R.A.M.*, xvii, p. 832], though it is in any case independent of *M. persicae*. Under the relatively dry climatic conditions prevailing in the vast potato-producing areas of north-east Germany, even thorough and repeated roguing does not achieve the unqualified success in virus elimination reported from Holland, and requires to be supplemented by other methods. The extension of peach cultivation not only necessitates the application of an insecticide to the trees during dormancy, but also the treatment of the potato crops with nicotine, which may well be combined with the routine programme for the control of *Phytophthora* [*infestans*] and *Alternaria* [*solani*]. In the Cologne district, where virus diseases are rife, completely healthy seed stocks of the susceptible Erstling [Duke of York] variety have been raised by these methods from original stocks of a high degree of purity, and both there and in the neighbourhood of Bonn Bordeaux mixture effectively combated the aphids without the addition of nicotine.

Early harvesting, before the virus has time to pass from the foliage to the tubers, is another method of control widely practised in Holland; there are, however, certain physiological drawbacks to this procedure, and attempts have been made to replace it by the destruction of the aerial organs with strong concentrations of copper sulphate. Experiments on similar lines, using carbolineum or sodium chlorate solution, are planned by the author. Berkner's method of late planting [ibid., xv, p. 457] did not give favourable results in the author's tests in 1937, the 1938 progeny of the July-sown seed being, in fact, much more severely infected, especially by leaf roll, than that of seed planted on the normal dates in April to May.

Experiments are now in progress to obtain disease-free material by isolating potato clones in the midst of cereals, each potato plant or

progeny from a single plant being separated from similar units by 3 m. of winter barley. The soil is treated with carbon disulphide (100 c.c. per sq. m.) and the potatoes alternately sprayed with Bordeaux mixture and a soapy extract of insect powder. So far the results appear to be promising.

Wartenberg (H.). **Die Grundlagen der Methoden zur Pflanzgutwertbestimmung an Kartoffelknollen.** [The foundations of the methods for determining the value of Potato tubers as seed.]—*Mitt. biol. Anst.* (*Reichsanst.*), *Berl.*, 58, pp. 1–28, 1 graph, 1938.

The writer describes and analyses the various procedures in current use for the determination of the soundness or 'degeneracy' of potato tubers destined for seed. Many of the methods enumerated have been noticed here [cf. *R.A.M.*, xvi, p. 829; xvii, pp. 549, 763, *et passim*].

Singh (B. N.) & Mathur (P. B.). **Artificial production of 'blackheart' in Potato tubers.**—*Phytopathology*, xxviii, 10, pp. 705–708, 1938.

Experimental data are presented showing that stored Katua potato tubers are most susceptible to 'black heart' [? at Benares, India: *R.A.M.*, xvii, p. 201] during the middle dormancy period, when 20·2 per cent. of the test material developed the condition after 48 hours' exposure to a temperature of 40·3° C., whereas in the early dormancy stages a corresponding period at 48·1° was required to produce comparable effects. The figures obtained for the late dormancy phase were anomalous, probably on account of the accidental inclusion of tubers in the incipient stage of sprouting. Data obtained from potatoes in the growing season showed that very small, actively growing tubers were much more resistant to 'black heart' than mature ones, the former remaining unaffected by 105 hours' exposure to a temperature of 57·1°, whereas 0·1 per cent. of the latter showed symptoms of the disease after 70 hours at 52·7°. During a ten-day period of ripening in the soil after cessation of growth, 0·9 per cent. of the tubers were found to be diseased after 90 hours' heating at 48·1°. Some evidence was obtained that large potatoes are more susceptible to 'black heart' than small ones.

Wenzl (H.). **Über die Zusammenhänge zwischen Braunmarkigkeit (Hohlherzigkeit) und Wuchsform der Kartoffelknollen.** [On the correlations between medullary browning (hollow heart) and growth form of Potato tubers.]—*Phytopath. Z.*, xi, 3, pp. 282–296, 4 figs., 3 graphs, 1938.

The examination at the Vienna Plant Protection Institute of four batches of Böhm's Allerfrüheste Gelbe potato tubers revealed a fairly reliable correlation between medullary browning or hollow heart [*R.A.M.*, xvii, p. 410] and an abnormal growth form, characterized by deep placing of the eyes and the development of cushions beneath them. These features were more conspicuous in large than in small tubers. Excessive thickness is another common symptom of hollow heart in large tubers, but length variations do not afford a safe diagnostic criterion. Although higher percentages of the disease were found among large misshapen tubers, a fair number of large individuals of approximately normal growth forms were also affected. The irregular growth

processes herein described, usually but not invariably localized below the eyes, are brought about at least partially by the withdrawal of reserve materials from the medullary region of the tubers.

Bordukova (Mme M. W.). **Über die Bestimmung der Widerstandsfähigkeit der Kartoffeln gegen die Phytophthora.** [On the determination of resistance to *Phytophthora* in Potatoes.]—*Obst- u. GemüsebWirtsch.*, ix, pp. 29–32, 1937. [Russian. Abs. in *Zbl. Bakt.*, Abt. 2, xcix, 9–13, p. 285, 1938.

In inoculation experiments by the very effective contact method to determine the varietal reaction of potatoes to *Phytophthora* [*infestans*] with a view to the control of the fungus by breeding in the U.S.S.R. [*R.A.M.*, xvi, p. 553, and cf. xvii, p. 413], a close study of the course of the disease revealed the following process. In resistant varieties, such as *Solanum demissum* forms *recurvoacuminatum*, *xitlense*, and *tlaxpehualcoense*, and No. 8670, the tissues are so sensitive to infection that necrosis rapidly sets in, resulting in very unfavourable conditions for the pathogen, which is quickly killed. In susceptible varieties, on the other hand, the tissues show no initial reaction to invasion, the cells only dying after the requirements of the parasite have been exhausted, at which stage the infected region is deeply permeated by the mycelium.

Van Haeringen (G. H.). **Eenige waarnemingen in de praktijk over Phytophthora erythroseptica.** [Some practical observations on *Phytophthora erythroseptica*.]—*Tijdschr. PlZiekt.*, xliv, 5, pp. 247–256, 1 graph, 1938.

Since 1926 the writer has been engaged on a study of the factors affecting pink rot of potatoes (*Phytophthora erythroseptica*) [*R.A.M.*, iii, p. 317; xv, p. 556], which is stated to be prevalent on reclaimed marsh soils in Holland, causing appreciable damage, especially in dry, warm seasons when the soil temperature rises to 20° C. and above at a depth of 10 cm., and water is withdrawn from the subsoil. Large tubers are liable to heavier infection than smaller ones. Control measures should include the cultivation of varieties retaining luxuriant foliage until late in the summer, such as Roode Star, Populair, and Eigenheimer; Eersteling [Duke of York] and Bintje are nearly always attacked. This desirable habit of growth may be promoted by liberal applications to the soil of stable manure and chlorine-free potash, correct methods of tilling, and prompt eradication of weeds. The structure of the soil should be improved in such a way as to minimize its capacity for conducting heat and evaporating water, e.g., by the incorporation of raw organic materials and green manure. Deep drainage should be practised in order to obviate the accumulation of stagnant water, and care taken to ensure the permeability of the subsoil.

Denny (F. E.). **Combining treatments for disinfecting Potato tubers with treatments for breaking dormancy.**—*Contr. Boyce Thompson Inst.*, ix, 5, pp. 397–402, 1938.

The germination of recently harvested potato tubers, after disinfection with mercuric chloride, yellow oxide of mercury, or formaldehyde

[chiefly against *Actinomyces scabies* and *Corticium solani*: *R.A.M.*, xvii, p. 835] was expedited by treatment of the intact tubers with vapours of ethylene chlorhydrin by allowing commercial 40 per cent. solution to evaporate from pieces of cheesecloth spread over a watch-glass placed on top of the tubers in jars; it was equally feasible to treat with chlorhydrin first, and disinfect afterwards. Germination was not as a rule as rapid with tubers disinfected before or after treatment as with those treated with chlorhydrin alone, but the time required for 90 per cent. emergence of sprouts of disinfected tubers was shortened by 30 to over 100 days by the chlorhydrin treatment. Retardation of germination was noted in tubers disinfected with the mercury compounds shortly after harvesting and not treated with chlorhydrin. Tubers previously disinfected with mercuric chloride or yellow oxide of mercury developed much rotting of the seed pieces if treated by the chlorhydrin dip method, which involved cutting the tubers into pieces, placing them in Mason jars, covering them with chlorhydrin solution (50 c.c. of 40 per cent. solution per l.), pouring off immediately, and storing for 24 hours in the closed jar. Cut tubers responded well, however, to the chlorhydrin dip treatment if disinfected with formaldehyde before cutting. When any one of the three disinfectants was used before cutting, soaking the cut tubers for one hour in solutions of 1 per cent. sodium thiocyanate or 2 per cent. thiourea hastened germination by 20 to 80 days.

Soesman (J. G.). **Wortelschimmels en Hevea-herontginningen.** [Root fungi and *Hevea* clearings.]—*Bergcultures*, xii, 36, pp. 1239–1244, 3 figs., 1938.

Practical directions are given for the control of *Fomes lignosus* in replanted *Hevea* rubber clearings [*R.A.M.*, xvii, pp. 553, 624, and next abstracts] in the Dutch East Indies by deep digging (the fungus has been observed to extend downwards for 4 m. on the tap-roots) and by the removal of infected roots of susceptible cover crops, such as *Tephrosia vogelii*, *Crotalaria anagyroides*, and *Centrosema pubescens*. In order to secure an adequate stand of resistant trees it is necessary to commence with a sound planting supply considerably in excess of that ultimately required. A conservative method of pruning should be adopted and care taken to prevent infection of the rubber trees by lamtoro [*Leucaena glauca*] stumps and unhealthy coffee bushes, both of which are susceptible to *F. lignosus*.

De Fluiter (H. J.). **Wortelschimmel en Heveaherontginningen.** [The root fungus and *Hevea* clearings.]—*Bergcultures*, xii, 37, pp. 1258–1266, 1938.

Commenting on Soesman's recommendations for the extermination of *Fomes lignosus* in *Hevea* rubber plantings in the Dutch East Indies [see preceding and next abstracts], the author agrees that when sound planting material has been used and conservative pruning adopted, intensive control measures are superfluous. However, should the fungus develop in spite of these precautions, vigorous and thorough control methods must immediately be undertaken.

s'Jacob (S. C.) & De Fluiter (H. J.). **Is er verband tusschen den toestand van de plant en de mate van virulentie van wortelschimmels?** [Is there a connexion between the condition of the plant and the degree of virulence of root fungi?]—*Bergcultures*, xii, 38, pp. 1290–1292, 1938.

The writers briefly summarize their observations on the connexion between debilitation of *Hevea* rubber and infection by *Fomes lignosus* [see preceding abstracts] and *F. noxius* [*R.A.M.*, xvii, p. 624] in the Dutch East Indies. In one rubber planting only 2 out of 108 sound trees were attacked by *F. noxius*, 6 out of 70 in poor condition, and 28 out of 34 dying or dead, the corresponding figures for another area being 2 out of 93, 4 out of 81, and 31 out of 38, respectively. The fungus had also spread to the coffee bushes interplanted among the diseased rubber trees. Sickly coffee bushes and stumped lamtoro [*Leucaena glauca*] were found to contract infection by *F. lignosus* and assist in the spread of the fungus to the neighbouring rubber trees. *Artocarpus blumei* stumps were shown to serve as reservoirs of infection by *F. noxius*, which may evidently remain dormant in the soil for years and resume activity with the advent of appropriate conditions for a parasitic existence.

Kletschetoff (A. N.). **Effect of Tau-saghyz seed treatment with the preparation 'granosan'.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xx, 2–3, pp. 195–198, 1938.

Examination of fruit and seed samples of the rubber-bearing plant tau-saghyz [*Scorzonera tau-saghyz*: *R.A.M.*, xvi, p. 406] revealed the presence of bacteria [unspecified] and numerous fungi (species of *Cladosporium*, *Alternaria*, *Fusarium*, *Epicoccum*, *Torula*, *Brachysporium*, *Penicillium*, and *Aspergillus*) on the surface of the fruit (achene), on the inner side of its coat, on the surface of seeds removed from the achenes, on the inner side of the seed coat, and occasionally within the embryo tissues. In laboratory seed-disinfection tests and field trials seed treatment with granosan (0·5 to 1 per cent. of the seed weight) markedly and consistently reduced the infection without affecting the rate of germination. Treatment of seed (1 per cent.) sown in sterilized and non-sterilized soil resulted in increases in the number of plants of 58 and 21 per cent., respectively, over the controls.

Campbell (Marie E.). **An investigation of the Mucorales in the soil.**—*Trans. roy. Soc. Edinb.*, lix, 2, pp. 411–436, 3 pl., 14 figs., 1938.

Full descriptions are given of the following organisms isolated from the soil in different parts of Scotland and grown on a medium of 2 per cent. agar, 4 per cent. malt, and 5 per cent. peptone (P_H about 6) in the dark at 17° to 19° C.: *Mucor spinosus*, *M. ramannianus*, *M. racemosus*, *M. circinelloides*, *M. fragilis*, *M. varians*, *M. microsporus*, *M. hiemalis*, *M. silvaticus*, *M. albo-ater*, *M. mucedo*, *M. saturninus*, *Zygorrhynchus moelleri*, *Z. vuillemini*, *Circinella sydowi*, *Rhizopus nigricans*, *Absidia glauca*, *A. cylindrospora*, *Dicoccum asperum*, *Chaetocladium jonesii*, *Piptocephalis cylindrospora* (parasitic on *M. albo-ater*), *Mortierella pusilla* [*R.A.M.*, xvii, p. 837], and *M. tuberosa*. Of these, only

three species were homothallic, viz., *P. cylindrospora*, *Z. moelleri*, and *Z. vuillemini*.

Zygospores were produced by *Mucor racemosus*, *M. hiemalis*, *A. cylindrospora*, *Z. vuillemini*, *Z. moelleri*, and *P. cylindrospora*. In the case of *M. hiemalis*, zygospore formation was much more profuse at 17° than at 26°, but no striking effects on sexual activity were exerted by various other factors considered. Hybrid zygospores were formed between opposite sexes of different species both of the same and of different genera. Perfect specimens were obtained between *M. varians* and the negative form of *M. hiemalis* and between *M. silvaticus* and the positive form of *M. hiemalis*, while imperfect hybridization occurred between the negative form of *A. cylindrospora* and the positive one of *R. nigricans*. Generally speaking, the positive forms of the Mucorales are more widely distributed in the soil than the negative. The positive mycelium of *M. hiemalis* was experimentally shown to be more resistant to desiccation over sulphuric acid than the negative, continuing to grow three months after the inception of the test, by which time the development of the negative forms had ceased.

Experiments on spore longevity in the different species of soil fungi under investigation are still in progress. To date, the spores of *M. spinosus*, *M. racemosus*, *M. hiemalis*, *M. mucedo*, *A. cylindrospora*, *R. nigricans*, *Z. moelleri*, *Z. vuillemini*, and *C. sydowi* have germinated after 7, 12, 11, 9, 12, 6, 9, 9, and 7 months, respectively.

No specific correlation could be traced between the distribution of the Mucorales forming the subject of this study and any particular soil type, certain species, e.g., *M. hiemalis*, *M. racemosus*, and *A. cylindrospora*, being practically ubiquitous. All soils, however, are not equally rich in the number of species of this group, heather moors and peat bogs, for instance, containing fewer than cultivated soils. Soil reaction does not affect all species equally: *Z.* spp. were isolated from soils at P_H 4·8 and 7·4, and *M. racemosus* at P_H 4·8 and 8, so that these species are evidently able to flourish throughout a wide range of hydrogen-ion concentrations. On the other hand, *M. hiemalis* and *A. cylindrospora* were found only between P_H 6·6 and 7·6 in the samples examined, suggesting relatively close dependence on soil reactions.

Varadaraja Iyengar (A. V.). **Some aspects of the control of spike disease in Sandalwood.**—*Phytopathology*, xxviii, 10, pp. 715–723, 1938.

This is a general survey of the past and present positions in the control of sandal (*Santalum album*) spike in India [*R.A.M.*, xviii, p. 55]. By far the most promising of the various methods of elimination hitherto tested is the destruction of diseased trees by the injection of sodium arsenite [ibid., xiv, p. 539], 1 gal. of which is stated to be sufficient for the treatment of an average of 150 trees. This procedure is now in use in Madras and Coorg, and several localities showing incipient infection have been freed from spike disease. A considerable improvement in the growth of sandal may be effected by the eradication of *Lantana* [*camara*: loc. cit.], which has gradually permeated even some of the dense forests of the Deccan plateau.

Luthra (J. C.), Sattar (A.), & Singh (S.). **Occurrence of stem canker disease of Sugarcane (Cytospora sacchari Butl.) in the Punjab.**—*Proc. Indian Acad. Sci.*, Sect. B, viii, 3, pp. 188–191, 1938.

Cytospora sacchari [*R.A.M.*, xvii, p. 840], first observed in the Punjab at Lyallpur in March, 1935, on dried pieces of several Coimbatore varieties lying about in the fields, was found in the same year as a saprophyte on Co. 244 and on Desi Ponda (thick chewing cane) in Lahore District. In the summer of 1936 it developed, apparently as a distinct parasite, on the standing crop at Lyallpur, almost all the infected canes wilting. It was also reported from three other localities.

Affected canes show drying up of the leaves from the tip downwards, wilting being the most severe form of the disease. The pycnidia are generally formed only when the cane is completely desiccated and they may develop on all parts of the cane that are above the ground. The fungus also becomes increasingly virulent when the cane reaches maturity. If it is present in the field, either as a parasite or a saprophyte, canes reserved for seed purposes and buried in the ground to protect them from frost are attacked and killed.

Isolations of the fungus from Co. 312, 313, 323, 371, and 395 sugar canes from Lyallpur and Co. 223 and 285 from Mozaffargarh and Jhang, respectively, were in all cases identical. Healthy canes of nine Coimbatore varieties were inoculated with a pure culture of the fungus by boring holes in the stem, inserting the culture and plugging the hole, each variety later showing 100 per cent. infection as against no infection in the controls (bored and replugged with no insertion of the culture). The fungus spread above and below the inoculation site to a distance of two or three internodes. No inoculated cane wilted, but disease symptoms appeared 10 to 15 days after inoculation, and pycnidia in 17 days.

Blumer (S.). **Pilze.** [Fungi.]—*Ber. schweiz. bot. Ges.*, xlviii, pp. 239–252, 1938.

The following are among the new records in this annotated list of recently discovered or otherwise remarkable representatives of the Swiss fungus flora: *Bremia lactucae* on *Centaurea imperialis*, *Gaillardia grandiflora*, and *Senecio elegans*; *Pseudoperonospora humuli* on wild hops, whether indigenous or introduced is not known, in a remote mountain valley of Glarus; and *Tuburcinia* [*Urocystis*] *gladioli* on *Gladiolus* sp. [*R.A.M.*, xvi, p. 63].

Moesz (G.). **Fungi Hungariae. II. Archimycetes et Phycomycetes.** [Fungi of Hungary. II. Archimycetes and Phycomycetes.]—*Ann. hist.-nat. Mus. hung.*, xxxi, pp. 58–109, 1938. [Hungarian and German.]

Continuing his studiés on Hungarian fungi, part I of which (Myxomycetes) appeared in *Folia cryptog.*, Szeged, i, 3, 1925–6, the writer presents a critically annotated list, supplemented by a four-page bibliography, of 33 Archimycetes and 258 Phycomycetes, including the following. *Olpidium brassicae* has been found attacking tobacco seedlings [*R.A.M.*, vii, p. 202]. It is of interest to note that potato wart (*Synchy-*

trium endobioticum) has disappeared even from the one locality (now belonging to Czechoslovakia) where it was detected by Schilberszky in 1896 (*Ber. dtsch. bot. Ges.*, xiv, p. 36), and is no longer to be found in Hungary [cf. *R.A.M.*, xiii, p. 799], so that the theory of its spread throughout Europe from this single focus is quite untenable. *Plasmodiophora solani*, claimed by v. Brehmer and Bärner to be implicated in the transmission of potato viruses [ibid., ix, p. 800], occurs on potatoes. Opium poppies (*Papaver somniferum*) are attacked by *Peronospora arborescens* [ibid., xvi, p. 563]. *Sclerospora graminicola* [ibid., xvii, p. 160] infects *Agrostis alba* in addition to *Setaria viridis* and *S. italica*. *Pythium hydnosporum* [*P. artotrogus*: ibid., vi, p. 360] has been detected in association with *Phomopsis vexans* [ibid., v, p. 466] and *Phytophthora infestans* on tomato [ibid., xvii, pp. 224, 364, 483].

Among entomogenous fungi may be mentioned *Empusa grylli* [ibid., xv, p. 705] on grasshoppers, *E. muscae* [ibid., xvi, p. 673] on flies, *Entomophthora aphidis* [ibid., xiii, p. 683] on lucerne aphids (*Amphorophora onobrychis*), and *E. sphaerosperma* [ibid., xiv, p. 33; xv, p. 18] on larvae of *Papilio podalirius*.

RAABE (A.). **Parasitische Pilze der Umgebung von Tübingen. Ein Beitrag zur Kryptogamenflora Südwestdeutschlands.** [Parasitic fungi of the environs of Tübingen. A contribution to the cryptogamic flora of south-west Germany.]—*Hedwigia*, lxxviii, 1–2, pp. 1–106, 5 figs., 1938.

This is a critically annotated list of about 430 parasitic fungi collected by the author in the Tübingen district of Germany from 1930 to 1932 and again during 1935–6. *Botrytis globosa* n.sp. [with a Latin diagnosis], responsible for pale, water-soaked spots on garlic leaves, frequently covering half the surface, is characterized by straight, pluricellular, simple or sparsely branched conidiophores, 0·3 to 0·8 by 12·5 to 15 μ, globular (14 to 18 μ in diameter) or slightly elliptical (14 to 21 by 12 to 20 μ) conidia, and small, greenish-brown sclerotia resembling in their dense, microcellular texture those of *Botrytis cinerea*. *Mycosphaerella hordei* forms greyish-brown, dry lesions on wheat leaves.

ELISEI (F. G.). **Revisione del genere Titaeosporina van Luijk (Deuteromycetes-Melanconiales).** [A revision of the genus *Titaeosporina* van Luijk (Deuteromycetes-Melanconiales).]—*Atti Ist. bot. Univ. Pavia*, Ser. IVa, x, pp. 283–287, 1938.

After referring to the establishment by van Luijk of the genus *Titaeosporina* with the type species *T. tremulae* (*Ann. mycol., Berl.*, xvii, pp. 110–113, 1919), based on the presence in herbarium material of *Gloeosporium populi-albae* and *G. tremulae* of conidia united into groups of two or more by connecting hyphae, the author points out that the occasional presence of these joined conidia is insufficient to establish more than a new variety, at most. From van Luijk's figures the acervulus, conidiophores, and conidia when young all belong to *Gloeosporium* and the joined conidia may have been merely united by anastomoses. A similar occurrence has been reported for *Ascochyta viciae* by Crosier (*Phytopathology*, xxv, 2, pp. 283–284, 1935).

HIRATSUKA (N.). **Notes on Japanese species of Uromyces.**—*J. Jap. Bot.*, xiii, 10, pp. 729–747, 1937.

Among the 73 species in this annotated list of Japanese *Uromyces* may be mentioned *U. decoratus* on *Crotalaria juncea* and *U. holwayi* on *Lilium auratum* [*R.A.M.*, x, p. 667].

KERN (F. D.). **Additions to the Uredinales of Venezuela.**—*Mycologia*, xxx, 5, pp. 537–552, 1938.

This annotated list of Venezuelan Uredinales adds 22 species from various sources to the previous lists [cf. *R.A.M.*, xiv, p. 397], bringing the total up to 205. *Puccinia arachidis* on groundnut [ibid., xiv, p. 212], *Uromyces fabae* on *Vicia faba*, and *U. striatus* on lucerne [ibid., xvi, p. 776] are recorded for the first time from Venezuela and *P. polyspora* on Guatemala grass (*Tripsacum laxum*) for the first time from South America.

MIX (A. J.). **Species of Taphrina on North American Ferns.**—*Mycologia*, xxx, 5, pp. 563–579, 3 figs., 1938.

This is an annotated, descriptive list, based on examination of material in the larger mycological herbaria of the United States and Canada, of ten species of *Taphrina* on North American ferns, arranged under their respective hosts. Five of the species are published as new [with Latin diagnoses].

WILTSHIRE (S. P.). **The original and modern conceptions of Stemphylium.**—*Trans. Brit. mycol. Soc.*, xxi, 3–4, pp. 211–239, 2 pl., 17 figs., 1938.

From the original diagnosis and from an examination of Wallroth's specimen of *Stemphylium botryosum* (1833) [*R.A.M.*, xvi, p. 575] the writer concludes that this species is identical with that known in the literature as *Macrosporium sarcinula* (1838), the conidial stage of *Pleospora herbarum*. Fungi with conidia of this type have been placed in the genus *Thyrospora* [ibid., v, p. 233], which is therefore synonymous with *Stemphylium*, and *T. parasitica* and various other species of *Macrosporium* are regarded as synonymous with *S. botryosum*. The modern conception of *Stemphylium* is traced to *S. lanuginosum* of Harz, with which Oudemans's culture of *S. botryosum* studied by Bolle [ibid., iv, p. 62] is considered to be probably identical. The author proposes to enlarge the original conception of *Stemphylium* to include the species similar to *S. lanuginosum*, placing the former groups in *Eustemphylium* and the latter in *Pseudostemphylium*. *T. sarcinaeforme*, found on clover in Hampshire in 1932 [cf. ibid., xiv, p. 396], is renamed *S. sarcinaeforme* (Cav.) n.comb., *M. sophorae* Turc. & Maff. 1912 being regarded as a synonym. *S. macrosporoideum* and *S. asperosporum* are deemed to be foreign to *Stemphylium*, and for want of a better genus are renamed, respectively, *Acrospeira macrosporoidea* (Berk.) n.comb. and *A. asperospora* (Cooke & Massee) n.comb.; a fungus of similar type received from Baarn is named *A. levis* n.sp. [with a Latin diagnosis]. In conclusion, *S. quadratum* is transferred to *Tetracoccosporium* as *T. quadratum* (Cooke) n.comb.

WALLACE (J. M.). **Acquired tolerance of curly top in Nicotiana tabacum.** —Abs. in *Phytopathology*, xxviii, 9, p. 674, 1938.

Tobacco plants are stated frequently to recover from [beet] curly top [cf. *R.A.M.*, xviii, p. 64], even those with severe symptoms on the terminal leaves often producing basal or lateral shoots virtually or entirely free from outward signs of infection. In other cases recovery may come about gradually by the production of mildly affected leaves and tissues in terminal shoots that have long shown conspicuous symptoms and retarded growth. Cuttings grown from recovered plants possess an acquired tolerance to curly top when tested by reinoculation, whereas those from healthy, uninoculated plants readily contract infection in an intense form. Tolerance also developed following infection with one strain of the virus after previous inoculation with another.

GUBA (E. F.). **Tomato leaf mold as influenced by environment.**—*Bull. Mass. agric. Exp. Sta.* 350, 24 pp., 7 graphs, 1938.

Studies conducted over a period of several years showed that tomato leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xvii, p. 634] is generally epidemic in greenhouses in Massachusetts from June to October, when the maximum temperatures in the houses range from 80° to 92° F., the mean minimum inside and outside temperatures differ by less than 5°, and the mean maximum relative humidity is 94 to 100 per cent. (the highest for the year). It was also found in outdoor plantings adjacent to greenhouses in which tomatoes were growing, and in places where the ground was uneven and the drainage poor.

The spores of *C. fulvum* are able to withstand severe winters, and remain viable under even the most adverse conditions for 9 to 12 months. Optimum conditions for germination consist in a relative humidity of 100 per cent., or precipitated moisture and temperatures of 75° to 78°. The minimum relative humidity at which germination occurred was 95 to 96 per cent., while the maximum and minimum temperatures were 94° and 40°, respectively. Viability was lost by exposure to 115° to 116° for 2 hours, and by longer exposures at somewhat lower temperatures. Exposure of infected plants for three hours to temperatures of 118° to 123° did not appreciably affect spore germination, but was injurious to the plants. Light retarded spore growth and suppressed germination, while strong light was lethal to the spores.

Infection is effected through the stomata, and took place generally or wholly on the lower surface of the leaf, where the stomata are most numerous, and where conditions in the leaf as well as those of light, temperature, and relative humidity at the surface are more favourable to germination than is the case on the upper surface. Flaccidity of the foliage, induced by moisture deficiency in the leaves, and darkness close the stomata and hinder infection.

The conditions existing at the leaf surface are of fundamental importance in the infection process, variations in severity in the greenhouse at different times of the year being due to environmental factors inducing or preventing germination on the leaf. Severity of infection is fundamentally related to temperature.

BAWDEN (F. C.) & PIRIE (N. W.). **Crystalline preparations of Tomato bushy stunt virus.**—*Brit. J. exp. Path.*, xix, pp. 251–263, 1 fig., 1 graph, 1938.

The following points may be noticed in this amplified account of the authors' study on the properties of the crystalline preparations of tomato bushy stunt virus [*R.A.M.*, xvii, p. 566]. The serological titres of the purified bushy stunt virus were found to be consistently lower than those of the liquid crystalline tobacco mosaic virus and potato virus X, a difference probably due to the different shapes of the virus, the particles of the bushy stunt virus apparently being spherical. Precipitates of tobacco mosaic virus and virus X with their antisera are flocculent, and after settling occupy a large volume, thus closely resembling those obtained with bacterial flagellar ('H') antigens, whereas precipitates of the bushy stunt virus with its antiserum form more slowly, are granular, settle as compact masses, and are of the type obtained with bacterial somatic ('O') antigens. The bushy stunt virus is shown to be inactivated by warm acetic acid and by wetting and spreading agents, such as sodium dodecyl sulphate. The amount of nucleic acid isolated from the supernatant fluids present when virus preparations inactivated by the above-mentioned agents are precipitated is from 15 to 20 per cent. of the weight of virus taken. The ash content of virus preparations recrystallized several times with ammonium sulphate and dialysed for many days against distilled water at P_H values from 3 to 5 did not usually fall below 3 per cent. Although the bushy stunt virus is very sensitive to dehydration, it did not precipitate and underwent no apparent change when exposed for some hours at room temperature to P_H values of between 1·5 and 9·5. At P_H 1 the virus solutions rapidly became water-clear and on neutralization the protein was precipitated and the virus inactivated. Exposure to P_H 10 for a few hours destroyed infectivity. The virus can be inactivated by ultra-violet light, nitrous acid, formaldehyde, or hydrogen peroxide without losing its crystallinity or serological activity.

MCFARLANE (A. S.) & KEKWICK (R. A.). **Physical properties of bushy stunt virus protein.**—*Bio-chem. J.*, xxxii, 9, pp. 1607–1613, 1 fig., 1 diag., 2 graphs, 1938.

A detailed account is given of the writers' studies at the Lister Institute, London, on the physical properties of specially prepared specimens of Bawden and Pirie's tomato bushy stunt virus protein [see preceding abstract], consisting of colourless solutions, water-clear by transmitted light.

The mean partial specific volume of 0·739 is approximately the same as Bawden and Pirie's value for tobacco mosaic and falls within the density range of the proteins as a class. The mean value of the sedimentation constant is determined as 146×10^{-13}, i.e. lower than for the tobacco mosaic and cucumber virus proteins but higher than those of potato virus X and tobacco ring spot [ibid., xvii, pp. 207, 647, *et passim*]. The boundary is that of a perfectly homogeneous protein and shows a degree of sharpness hitherto obtained only with some of the heavier haemocyanins. The P_H stability range is a comparatively wide

one (2·40 to 8·70). There were no signs within this range of a minimum solubility zone with molecular aggregation such as characterizes some of the anisotropic virus proteins. The sedimentation equilibrium was found to be complete after 96 hours. The mean molecular weight value of the protein, determined by two alternative formulae, Svedberg's and Pedersen's, is 7,600,000. Calculated by sedimentation velocity measurements (Stokes's law), the weight of the molecule is 8,800,000 and its radius 13·7 mμ, indicating little or no tendency towards asymmetry. The minimum electrophoretic mobility was registered at P_H 4·12 (0·15 cm. $2V.^{-1}$ $sec.^{-1} \times 10^{-5}$) and the maximum (4·59) at P_H 5·47. The isoelectric point of the virus protein was found to be $P_H = 4·11$.

MOUNCE (IRENE) & MACRAE (RUTH). **Interfertility phenomena in Fomes pinicola.**—*Canad. J. Res.*, Sect. C., xvi, 9, pp. 354–376, 1 map, 1938.

In further studies on the biology of *Fomes pinicola* [*R.A.M.*, viii, p. 690; xviii, p. 4], cultures from 43 new sources originating on various coniferous and deciduous hosts in various localities of Canada, the United States, France, Sweden, Germany, and Japan, served to pair all possible combinations of a number of monosporous mycelia. As a result it became evident that the isolates from North America may be divided into a large group, A (containing isolates from *Abies*, *Picea*, *Pinus*, *Pseudotsuga*, *Tsuga*, *Betula*, *Populus*, and *Prunus*), and a small one, B (from *Picea*, *Tsuga*, and *Populus*). Clamp-connexions were formed in every pairing of one member of either of the two groups with any other member of the same group, but not crosswise. Thus each of the two groups is interfertile within itself but not cross-fertile with the members of the other group. Isolates from Europe and Japan form a third group, C (from *Picea*, *Pinus*, *Betula*, and *Salix*), which is completely interfertile within itself, almost completely fertile with members of group A, and only partially sterile with some of the members of group B. The three cultures isolated from *Populus* included in group B were obtained from sporophores typical of the form common on that host, sometimes regarded as a separate species, *F. marginatus*. The remainder of the isolates in group B were, however, the typical 'red belt' form commonly found on coniferous hosts.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xii, 10, pp. 219 M–220 M, 1938.

COLOMBIA. In pursuance of Decree No. 742 of 27th April, 1938, the banana-growing region of the Department of Magdalena is declared a quarantined zone owing to heavy infection by *Cercospora musae* [see above, p. 124]. As an immediate preventive measure against the further spread of the disease, growers were instructed to strip off all infected leaves from the plants and destroy them by burning or burying at a depth of not less than 60 cm. within 15 days of the date of promulgation of the above-mentioned Decree.

Decree No. 762 of 29th April, 1938, places the campaign against sugar-cane mosaic [*R.A.M.*, xviii, p. 56] in the hands of a technical Commission, whose work will be assisted by a Central Sugar-Cane Experiment Station.